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EDMONTON
BROKERAGE DEMONSTRATION PROJECT

FINAL EVALUATION REPORT

by

THE CITY OF EDMONTON TRANSPORTATION DEPARTMENT
LOUIS G. GRIMBLE PROFESSIONAL ENGINEER LTD. in
association with MANOP SERVICES LTD.

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The contents of this report reflect the views of the authors and not necessarily the official view or opinions of the Transportation Development Centre of Transport Canada.

Le contenu de ce rapport reflète l'opinion des auteurs qui n'est pas forcément l'opinion officielle du Centre de développement des transports, Transports Canada.

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16. Abstract

The Edmonton DATS Brokerage Demonstration Project was undertaken by the City of Edmonton with the assistance of the Transportation Development Centre of Transport Canada. The objectives of the project were: (1) to evaluate the effectiveness of a "brokerage management concept" in a paratransit operation; and (2) to demonstrate the application of an off-the-shelf computerized scheduling aid and management assistance program.

The report evaluates the performance of the project and the cost effectiveness achieved in two years of operation. The computer-aided scheduling and management assistance program is described and evaluated in terms of its contribution to the management of the system. The experience gained in introducing and operating a "brokerage system" is described including dealing with the taxi industry, contracting to independent owner-operators, and optimizing the partnership between the private and public sectors in providing paratransit services.

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16. Résume

La démonstration du système de courtage DATS, entreprise par la ville d'Edmonton avec le concours du Centre de développement des transports, avait pour objectifs:
1) d'évaluer l'efficacité du courtage appliqué aux transports semi-collectifs, et
2) d'éprouver le progiciel utilisé comme aide à la régulation et à la gestion.

Le rapport rend compte des performances et du degré de rentabilité constatés au cours des deux années qu'a duré l'opération. Il décrit le progiciel utilisé, son apport à la gestion du système ainsi que l'expérience acquise grâce à la mise en service et à l'exploitation du système de courtage, notamment sur le plan des relations avec les entreprises de taxi, de la sous-traitance aux propriétaires-exploitants indépendants et de l'optimisation de la collaboration entre les secteurs public et privé en vue de la mise à disposition de services semi-collectifs.

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SUMMARY

In April 1985, the City of Edmonton Transportation Department and its Custom Transportation Services Section which was responsible for paratransit services operated by the City's Disabled Adult Transportation System, entered into a demonstration project with the Transportation Development Centre of Transport Canada to demonstrate the application of a "brokerage management concept" in the provision of paratransit services. The project was also designed to evaluate an off-the-shelf computer program as a scheduling and management aid.

The need for the project was identified in policy studies conducted in 1984 by the City of Edmonton Transportation Department which indicated that if the latent demand for service were to materialize because of policy changes, etc., significant increases in the operating budget would be required under the present management structure; therefore alternatives should be tried to improve the cost-effectiveness of the system. A study, Review of DATS and Proposed Brokerage Demonstation Project, (Louis G. Grimble Professional Engineer Ltd. and Manop Services Ltd., 1985) was undertaken to recommend a new structure. This study plus a concurrent review of the computer system, DATS Computer Scheduling System: A Review and Analysis, (Trans Vision Consultants Ltd., 1985) recommended that a "brokerage" system be implemented and that a new computer program be obtained in lieu of investing more resources in enhancing the existing system. On August 1, 1985, the Brokerage Demonstration Project began operations and on October 27, 1986 the new computer-aided scheduling system was implemented.

This report provides an overview of the demonstration project during its first two years of operations and evaluates the effectiveness of both the "brokerage mangement structure" and the computer-aided scheduling system in meeting the stated objectives.

The major objective of the "brokerage management concept" was to create a centralized scheduling, dispatching and administrative centre which could, through contractual relationships with a variety of service options (ranging from the operation of City-owned lift-equipped vehicles operated under contract on a cost per hour basis to privately owned lift-equipped vans and sedans operated on both a flat rate and cost per hour basis) "broker" trips to the most cost-effective provider given the requirements of the patron. Since more than 50 percent of DATS users did not require high cost lift-equipped vehicles, cost savings could be achieved by allocating trips to lower cost options such as taxis and private owner-operated vans.

The brokerage system demonstrated that significant cost savings could be achieved. During the two years of the project costs per trip declined by 12.4 percent in current dollars and ridership increased by 18 percent (305,690 trips per annum). Because of the ability to adjust service levels to meet demand, trip refusals have been reduced from over 4,000 per year to virtually nil.

The brokerage system has also permitted a variety of innovations in service delivery to be introduced which have lead to improvements in service quality and cost. For example, private van owner-operators were encouraged to install wheelchair lifts and were then contracted to provide service in low demand off-peak periods when hourly based lift-equipped buses cannot be utilized productively. This has produced a valuable side benefit to the City's disabled

community by making it economically possible for privately-operated lift-equipped vehicles to be available for hire on a private basis.

The demonstration project also tested an off-the-shelf computer program to provide computerized scheduling and management aids. Although DATS had been operating with a computerized automatic scheduling system for two years, the system was not able to perform as designed. Therefore a new computerized system was introduced to manage registration, trip reservation and management reporting information. The new system has permitted significant improvements in the management of the brokerage operations. Better trip tracking and faster management reporting have been achieved as well as improved methods of system performance evaluation. The elimination of hand recorded trip information has improved accuracy and reduced time required to take reservation and booking information. The coordination of all trip records on one data base has also made it easier to retrieve both individual trip records for tracing trips and aggregatd trip data for analysis of operating performance.

This report fully describes the methods of implementation of the "brokerage management concept" to permit other properties to determine the applicability of the DATS experience to their operating conditions.

SOMMAIRE

En avril 1985, la section Transport adapté du Service des transports en commun de la ville d'Edmonton a lancé, avec le concours du Centre de développement des transports, Transports Canada, un projet pilote de "courtage" en matière de service de transport semi-collectif, qui devait aussi permettre d'évaluer un nouveau progiciel d'aide à la régulation et à la gestion des réseaux de transport.

Des études d'orientation, menées en 1984 par le Service des transports en commun d'Edmonton, avaient montré que si la demande latente de transport adapté devait se matérialiser à la suite des changements de politique des transports envisagés, etc., d'importantes augmentations du budget d'exploitation s'imposeraient si l'on ne modifiait pas la structure administrative actuelle. Devant cette perspective, il devenait impérieux d'explorer de nouvelles avenues dans l'espoir d'améliorer la rentabilité du service, d'où la décision de lancer ce projet pilote. Une étude intitulée: "Review of DATS and Proposed Brokerage Demonstration Project" (par Louis G. Grimble Professional Engineer Ltd. et Manop Services Ltd., 1985) a donc été entreprise dans le but de définir la nouvelle structure à mettre en place. Cette étude, menée concurrement à un examen du système informatique objet du rapport "DATS Computer Scheduling System: A review and Analysis" (par TransVision Consultants Ltd., 1985) a mis de l'avant l'idée d'un système de "courtage" et recommandé l'acquisition d'un nouveau progiciel au lieu de consacrer d'autres ressources à l'amélioration du système existant. Le 1er août 1985, le projet pilote de courtage commençait et le 27 octobre 1986 un nouveau système de régulation assisté par ordinateur était mis en place.

Le présent rapport récapitule les deux premières années de fonctionnement du projet pilote et évalue l'efficacité du système de courtage et du système de régulation assisté par ordinateur, par rapport aux objectifs qui avaient été fixés.

Le principal objectif du volet "courtage des services de transport" était de créer un central d'administration et de régulation des transports adaptés qui, grâce à des ententes contractuelles, pourrait choisir entre toute une gamme d'options de service (véhicules adaptés appartenant à la ville exploités en vertu de contrats de service à rémunération horaire, véhicules adaptés (fourgonnettes ou voitures) exploités par des particuliers à tarif fixe ou horaire, etc.) celle qui répondra au plus bas coût à la demande de transport exprimée. Comme plus de la moitié des usagers du DATS n'ont pas besoin de véhicule adapté (c'est-à-dire d'un véhicule à plate-forme élévatrice) pour assurer leurs déplacements, d'intéressantes économies pourraient être réalisées en faisant appel à des options de service moins coûteuses comme les taxis et les fourgonnettes ordinaires exploitées par des particuliers.

Le système de courtage mis en place a fait la preuve que d'importantes économies pouvaient être réalisées. Au cours des deux années couvertes par le présent rapport, le coût du déplacement a baissé de 12.4 p. cent en dollars courants et la clientèle a augmenté de 18 p. cent (305,690 déplacements annuellement). En raison de la très grande souplesse du système, les demandes de transport non satisfaites sont tombées de plus de 4 000 par année à pratiquement zéro.

Le système de courtage a également permis une série d'innovations dans la prestation du service, qui ont toutes débouché sur une amélioration de la qualité du service et une réduction des coûts. Par exemple, des subventions ont été accordées à des propriétaires exploitants de fourgonnettes afin qu'ils équipent leurs véhicules d'une plate-forme élévatrice et puissent assurer, à contrat, le service de transport adapté en périodes creuses, en remplacement du service adapté régulier qui n'est jamais rentable dans ces conditions. Les handicapés de la région d'Edmonton ont pu tirer de cette innovation un précieux avantage subsidiaire, ayant dorénavant accès à des véhicules de transport adaptés économiques qu'ils peuvent prendre en location à titre privé et à peu de frais.

Le projet pilote a également servi à évaluer un nouveau progiciel d'aide à la régulation et à la gestion de réseaux de transport. En effet, même si le réseau DATS (Disabled Adults Transportation System) exploitait depuis deux années un système de régulation assisté par ordinateur, celui-ci ne répondait pas à toutes les attentes formulées. Le nouveau progiciel mis en place pour automatiser les inscriptions, les réservations et l'information de la gestion a permis d'améliorer considérablement l'efficacité des opérations de courtage. Il a permis un meilleur suivi des prestations et une information plus rapide de la gestion ainsi que des méthodes plus efficaces d'évaluation des performances. L'élimination des fichiers manuels a fait baisser le nombre d'erreurs et le temps nécessaire pour prendre les réservations et les coordonnées de la clientèle. L'intégration de toutes les informations dans une seule et même base de données a rendu plus facile le contrôle des prestations, cas par cas, ainsi que le rappel de données agrégées pour les besoins de l'analyse des performances.

Ce rapport décrit en détail les méthodes de mise en place d'un système de "courtage des services de transport" de façon à permettre à d'autres commissions de transport de déterminer si elles pourraient tirer profit de l'expérience de DATS dans les conditions qui leur sont propres.

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1. INTRODUCTION

1.1 Purpose and Scope of the Project

In January 1985, the City of Edmonton Transportation Department in association with the Transportation Development Centre of Transport Canada initiated a two phased feasibility study and demonstration project to investigate and test the benefits of a "transportation brokerage management application" for the delivery of transportation services to the disabled. The first phase of the project was a study to investigate the feasibility and potential benefits of implementing a brokerage management project in Edmonton. The findings and recommendations of this first phase which are documented in the report Review of DATS and Proposed Brokerage Demonstration Project: Phase I Report, lead to the actual implementation of a brokerage management system on an eighteen (18) month demonstration project basis (the second phase). The implementation and findings of this demonstration project are the subject of the following report.

The Custom Transportation Brokerage System demonstration project was implemented on August 1 1985, as a combined management organizational and computer technology demonstration project.

The specific objectives of the project were:

1. Evaluate the "brokerage management concept" as a means of achieving greater cost effectiveness through the coordinated assignment of trips to the most appropriate service option.

2. Achieve greater fiscal control of the system through a centralized control over trip assignment.

3. Facilitate the testing of an off-the-shelf computerized scheduling and management information system appropriate to the trip assignment and control requirements of a brokerage system.

In addition, the coordination of all services out of a central "brokerage center" was expected to achieve improvements in the following administrative operations.

1. to improve consumer access by reducing congestion on the telephone system;

2. to reduce the possibility of errors in client bookings;

3. to improve service reliability;

4. to improve individual bus runs through better scheduling;

5. to maintain vehicle utilization (productivity);

6. to improve budget adherence.

1.2 The Location: City of Edmonton

The City of Edmonton is the capital of the Province of Alberta and has the distinction of being Canada's largest northern city.

In 1986 the City population was 525,000 while a population of 657,000 resided in the total metropolitan area. The Edmonton economy is based largely on petroleum product production and the oil field service industry, warehousing and distribution and the public service sector. One of the unique features of the City is that it not only operates conventional public services such as transit, police, fire, etc., but also owns and operates a power utility, telephone company and a municipal airport which serves both Western and Northern Canada.

In Edmonton, transportation for the disabled is provided through a mix of programs and providers including municipally funded and operated programs, provincially funded user subsidy programs, student transportation and private initiatives. The City of Edmonton funds and operates a senior citizen transit fare subsidy program for conventional transit and the Disabled Adult Transportation System (DATS). In addition the City has incorporated elevators, wheelchair restaint systems and other facilities to make the Light Rail Transit system accessible.

DATS has been in operation since April, 1975. It has evolved from a system operated by one taxi firm with 3,800 registrants and accommodating 250 trips per weekday in 1976 to its current brokerage format coordinating 16 operating contracts with 8,100 registrants and accommodating approximately 1,300 trips per weekday in 1986.

DATS is a door-to-door transportation service for Edmonton citizens who are 16 years of age or older (persons 13 through 15 years of age are also eligible, with certain restrictions on use) who cannot use regular transit because of a physical disability. All users of the service must register with the system. Service is provided seven days a week from 0600 hours to 0030 hours. Funding for DATS is cost/shared with 86 percent from the City of Edmonton tax levy, 6 percent from the Province of Alberta and 8 percent recovered through the fare box.

1.3 Background to the Project

In 1983 the City of Edmonton Transportation Department conducted a comprehensive handicapped and elderly transportation policy study. The objectives of this study were:

1) To review current and long-range policy requirements for transportation services for the elderly and handicapped (E&H) in Edmonton: and;

2) To develop a policy strategy to satisfy, in a cost effective manner, current and future E&H transportation needs.

The study developed a comprehensive approach for future service planning and identified several constraints to meeting future service delivery needs within the existing DATS organization including the following:

1) DATS was organized primarily to serve the physically disabled. If a change in the eligibility criteria were made to include those among the elderly and mentally handicapped who could require special transportation, potential demand could increase by a factor of 2.8 times. DATS is primarily for adults, aged 16 or more who are unable to use the regular public transit services because of physical disabilities. However, the City has been receiving requests to revise the eligibility criteria to include other groups.

2) If future needs were to be met, and if the system were to be both user effective and cost effective, a substantial reorganization of DATS would be required.

3) Since about one half of the DATS users do not require a lift-equipped vehicle and since the main growth in users eligible for service will be those who do not require wheelchair assisted services, it is possible to use other vehicles to achieve cost efficiencies.

The findings and recommendations of this study are detailed in a series of working papers and summarized in Handicapped and Elderly Transportation Policy Study: Summary and Recommendation Report. (City of Edmonton Transportation Department, 1983).

Subsequent to the above study, the Transportation Department in consultation with a consumer steering committee and the DATS Advisory Council began a review of the "brokerage concept" as it applied to DATS. The "brokerage concept" implies that the agency dispatching service is not necessarily the vehicle operator. Taxi firms are commonly organized in this manner where the vehicles are owned by individuals and trips are dispatched by a "broker". Substantial research was already underway in North America on the potential application of brokerage systems which could be considerably more cost effective than the system then in use in Edmonton. Consultants were engaged in January, 1985 to review DATS and to determine the feasibility of an application of the "brokerage concept". At the same time, an application was made to the Transportation Development Centre of Transport Canada for the funding of a demonstration project to test the brokerage concept and to test the application of an appropriate computer system to provide a tool for managing the brokerage functions. With financial support from Transport Canada, City Council on April 23, 1985 authorized the Transportation Department to proceed with the implementation of the demonstration project.

On August 1, 1985, after tendering the new services, after setting up a new operations and maintenance center, and after setting up the new organization and staff, the Custom Transportation Services Brokerage Demonstration Project started operations.

1.4 Organization of the Report

The following sections of the report document the progress of the demonstration project from the initial feasibility and development phase through the approval, implementation, and evaluation phases (Figure 1.1). Chapter 2 outlines the events leading up to the decision of City Council in April 1985 to proceed with the project. Chapter 3 documents the tasks required to establish and operate the Brokerage Centre including establishing initial infrastructure, contracting for service operations, and documenting the transitional problems and some of the early operational experience and adjustments. Chapter 4 provides an overview of the selection, installation and evaluation of the computer-aided scheduling system. An evaluation of the project is detailed in Chapter 5, while Chapter 6 provides a summary of the project and a brief consideration of project implications.

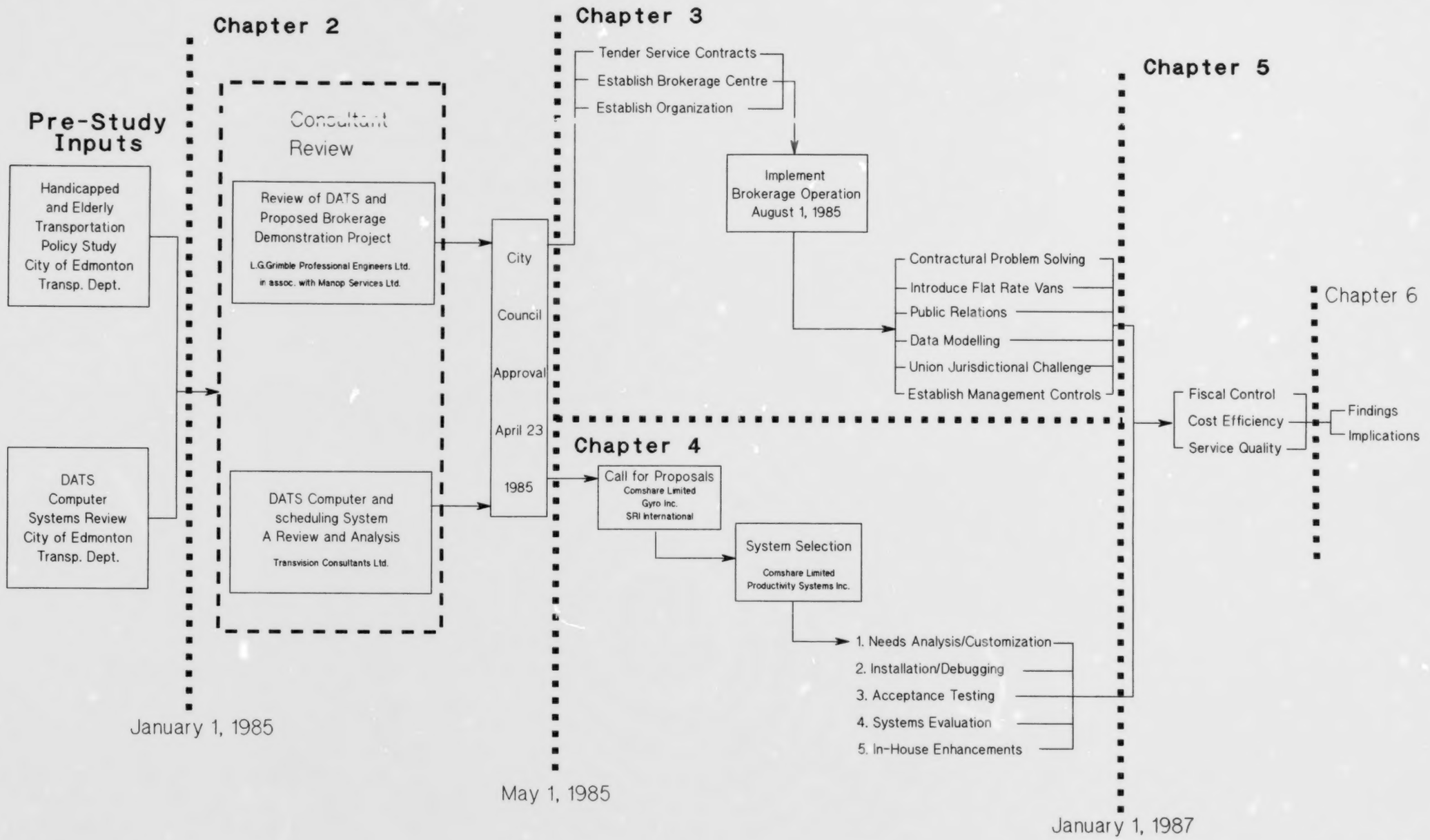

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Figure 1.1 Custom Transportation Brokerage Demonstration Project

2. CUSTOM TRANSPORTATION BROKERAGE FEASIBILITY STUDY AND APPROVAL PROCESS

2.1 Introduction

A feasibility study was conducted prior to the implementation of the Custom Transportation Brokerage Demonstration Project. The findings of this study were reviewed with City Council and public hearings were held to facilitate the presentation of the concerns of various interest groups. This following chapter provides a general summary of the feasibility study findings and recommendations and highlights the central issues identified during the project approval process (Figure 2.1).

2.2 DATS Review and Brokerage Feasibility Study

Within the transportation industry, the brokerage concept has long been applied to the management and operation of trucking and taxi operations. In the paratransit industry, especially in the transportation of the ambulatory disabled, the application of the brokerage concept incorporating the integration of the taxi industry, has been widely considered in the literature and successfully implemented in various centres. Of note are applications in Allegheny County, Pennsylvania; Quebec City, Quebec; and Hamilton, Ontario.

The potential of a brokerage application in Edmonton was identified in the 1983 Handicapped and Elderly Transportation Policy Study conducted by the City of Edmonton Transportation Department. In January, 1985 Louis G. Grimble Professional Engineer Ltd. in association with Manop Services Ltd. were retained to undertake a comprehensive review of DATS to further investigate the feasibility of an Edmonton brokerage application. The consultant report, entitled Review of DATS and Proposed Brokerage Demonstration Project was submitted in March 1985, with an Addendum issued in June 1985 to clarify some of the questions of fact raised by one of the existing DATS contractors. Concurrently a study of the existing computerized scheduling and reservation system was also carried out under the mandate of the review, by TransVision Consultants Ltd. of Vancouver. This component of the work, entitled, DATS Computer Scheduling System: A Review and Analysis, formed the basis for the second objective of the demonstration project which was the introduction of new off-the-shelf computer aids to assist in the management of the brokerage functions.

The emphasis of the feasibility report was to review the system as a whole, including City management, contractors, and hardware such as vehicles and information processing methods and computers with the objective of advising on future actions. The report thus was future oriented with little reference to the past history of DATS or to the progress which had been made during its ten years of evolution and development, an omission which caused concern among some who had been involved in the system. Even though the DATS system had achieved a good productivity and cost effectiveness. Overall, future improvements and a continuation of this trend could only be achieved by major changes to the hardware and contractural structure. As in any system which is experiencing growth in demand to new thresholds, new ways of operation were required rather than simple expansions of the existing system.

Based on the anticipated demand for DATS service outlined in the policy review study, the consultant report projected financial implications under alternative service organizational scenarios including the brokerage concept.

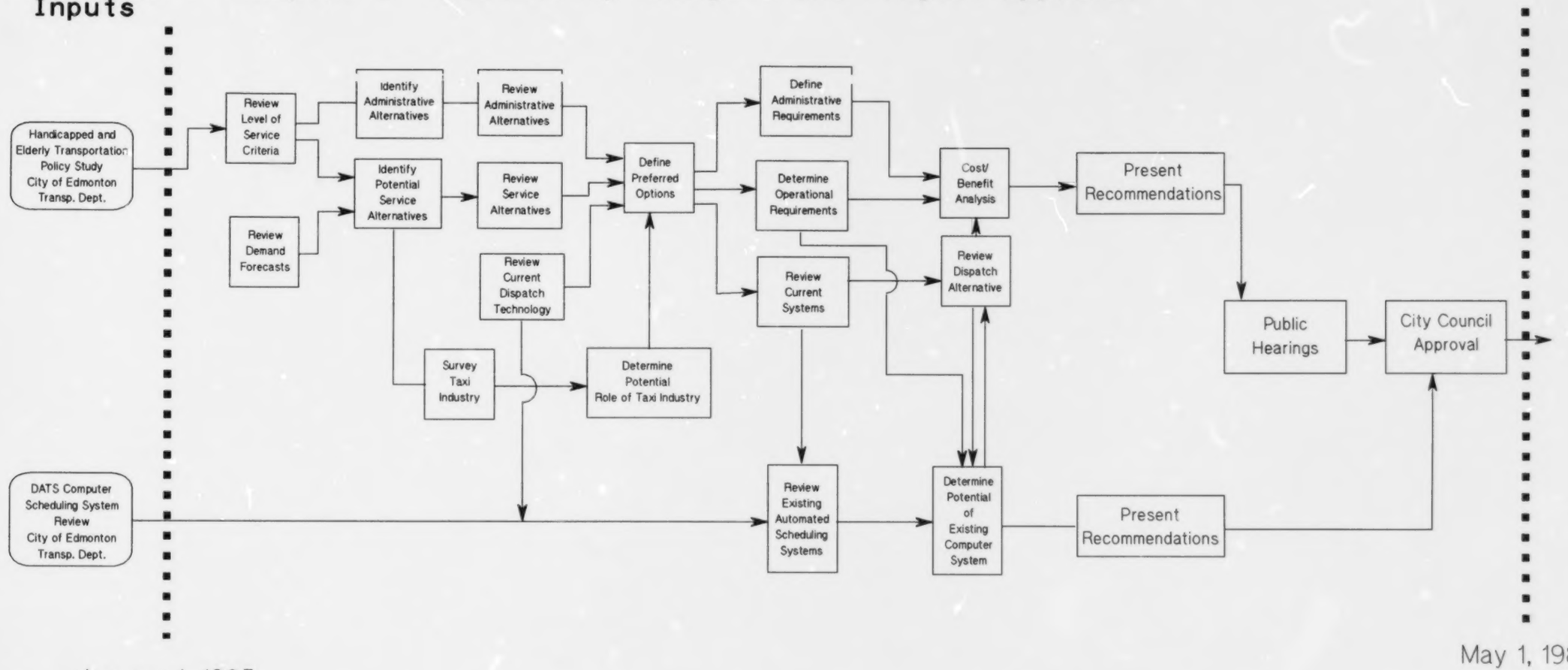

Pre-Study Inputs
Chapter 2 Feasibility Analysis and Project Approval
Handicapped and Elderly Transportation Policy Study City of Edmonton Transp. Dept.
Review Level of Service Criteria
Identify Administrative Alternatives
Review Administrative Alternatives
Identify Potential Service Alternatives
Review Service Alternatives
Review Demand Forecasts
Review Current Dispatch Technology
Survey Taxi Industry
Determine Potential Role of Taxi Industry
Define Preferred Options
Define Administrative Requirements
Determine Operational Requirements
Review Current Systems
Cost/ Benefit Analysis
Review Dispatch Alternative
Present Recommendations
Public Hearings
City Council Approval
DATS Computer Scheduling System Review City of Edmonton Transp. Dept.
Review Existing Automated Scheduling Systems
Determine Potential of Existing Computer System
Present Recommendations
January 1, 1985
May 1, 1985

Figure 2.1 Feasibility Study and Project Approval Process Activities

2.2.1 Feasiblity Study Findings

The major findings of the feasibility study were as follows:

1) The most important element controlling the reliability and the cost-effectiveness of the DATS service is the function of vehicle dispatching.

2) The existing administrative organization for DATS did not provide for the use of the most cost-effective mix of service operators.

3) Since 50 percent of the DATS users did not require a lift-equipped vehicle, there was a potential for a greater utilization of automobile services at substantial cost savings. These savings could be used to meet some of the latent demand for service. This would permit the City to serve latent demand from within existing service parameters.

4) The City did not have direct control over either the reliability or the cost-effectiveness of DATS because the management of the vehicle dispatching function fell within the major service provider contract.

5) The City's existing contracting process did not provide incentives for the scheduling contractor to be cost effective, to monitor operations, and to provide the City with sufficient data to assess the reliability of the DATS service.

6) Based on provincial inspection reports, there was a concern over the quality of vehicle maintenance which fell within this same contract.

7) The efficiency of the dispatching function, and hence the quality of service, was being impaired by the utilization of an automated system that was in danger of becoming obsolete.

8) The existing computer-supported dispatching system was unable to cope with current demand levels, did not have the capability for expansion, and did not support the need for service monitoring. The replacement of this system with a more efficient centralized computerized dispatching system could provide additional cost savings that could be used to expand service.

9) With the brokerage concept, a mix of private enterprise operators could be coordinated by a Broker/Manager directly responsible to the City. Such a Broker/Manager could establish firm control over the operation of a cost-effective mix of vehicle operators, ensuring that the system was run for the City's and the users' benefit.

10) A new centralized brokerage organization for DATS, equipped with a more efficient computerized dispatching system and directed by an experienced management/consultant team responsible to the City, could develop the optimal administrative and scheduling models for the future. Such an organization could be provided under a management contract, with the City having the option of taking over the management function in the future.

2.2.2 Feasibility Study Recommendations

The recommendations of the joint consultant/staff project team included the following:

1) The City should implement a centralized brokerage management organization for the dispatching of all DATS services. The City should take advantage of the current opportunity to evaluate such an organizaiton within a demonstration project.

2) The dispatching function contained within the major bus service contract should be completely removed and separate pricing should be considered for the maintenance of City vehicles. The use of City maintenance facilities as an option should be considered.

3) The specification for the service contracts should be revised to include the following: "The contractor's operations manager shall be directly responsible to the DATS Broker/Manager who will direct the scheduling and dispatching of all vehicles".

4) The City should engage or appoint a DATS Broker/Manager/consultant team by contract ending December 31, 1986.

5) The term of the service operating contracts should be three (3) years.

6) The initial term for a separate dispatching contract should expire on December 31, 1986, to allow the option of the City taking direct control of the dispatch centre once the new organization and technology had been tested.

7) All revenues from DATS service should accrue to the City.

8) The City should invite proposals from interested suppliers for a new computerized dispatching system.

9) Provision should be made to move the A.C.T. (a recreation centre for the disabled) scheduling function to the new brokerage organization.

10) Provision should be made for two types of automobile services: the sedan service currently operated and new services to be operated by taxis.

11) The savings generated by the new mix of service providers and a more efficient dispatching system should be used to begin serving the latent demand for the physically disabled (existing eligible users) and then extending service to the elderly and the mentally handicapped.

2.3 Approval Process

Implementation of the Brokerage Demonstration required approval of Edmonton City Council. A report recommending the Demonstration project was submitted to City Council by the Transportation Department. To permit those members of the public who were interested in disabled transportation services an opportunity to have input, City Council directed a committee of Council, the Public Affairs Committee, to hear any interest groups and to bring a recommendations report back to City Council.

2.3.1 Proceedings of the Public Affairs Committee

The Public Affairs Committee, at its meeting of March 29, 1985, reviewed the Feasibility Report and heard representation from the Transportation Department, an existing DATS contractor, representatives from the DATS Advisory Council,disabled individuals, and a private contractor operating a taxi firm with vehicles designed to accommodate wheelchairs.

As a result of concerns raised by the existing contractor, City Council at its meeting of April 9, 1985, directed the Committee to further review the brokerage concept and to resolve those concerns raised at the Committee's hearings. However, in doing so, it solicited the agreement of the existing contractors to maintain their contractual responsibilities for an additional month to permit the Committee to make a recommendation. At their meeting of April 18, 1985 the Committee reviewed the concerns of the existing contractor and recommended the following:

1. That the Administration implement a brokerage transportation system as outlined on a demonstration basis for an eighteen month period from July 1, 1985, to December 31, 1986, and quarterly reports evaluating performance submitted to the Public Affairs Committee.

2. That an operational audit of the Custom Transportation Services Brokerage Implementation Project be submitted to the Public Affairs Committee April 1, 1986, compared to an audit of the existing situation.

3. That the Administration be instructed to arrange lease space suitable to the requirements contained in the report and to recommend same to the Executive Committee.

4. That every effort be made to retain the present staff, now in the employ of the existing contractor and further that the hiring practices of affirmative action be implemented.

5. That the existing service contracts be extended by one month from June 30, 1985 to July 31, 1985 assuming no penalty to the City.

6. The maintenance component for the City owned vehicles be isolated in tender packages, with Mobile Equipment Services bidding on work and an analysis be prepared on the disadvantages/advantages to the City on a corporate basis.

This report was presented to Council on April 23, 1985, and was passed permitting the implementation of the Brokerage Demonstration project to proceed.

2.4 Issues of Public Concern to Interested Parties

Although the technical studies indicated that the brokerage concept would achieve service benefits, the approving authority, in this case City Council, required that many non-technical issues also be addressed. In this case one of the most difficult aspects of the process was to propose the changes in the system necessary to accommodate future problems without otherwise implying or focussing on the problems of the existing system and in so doing create a resistance to change among those who had an interest in the existing system. This was important because of the history of the evolution of DATS.

DATS had gone through a number of changes during its ten years of operation. In most cases these changes had resulted in improvements to the system. For example from 1982 - 1985 significant productivity gains and improvements to the service were achieved. However, what was apparent from the feasibility studies was that the organizational structure would not be able to cope with increasing demand without significant funding increases. Therefore a new structure was needed to give the system the capacity to meet new demands within budgetary restraints. One of the major concerns of the City Council and of the existing contractor was to clarify the perception that the problem was not the present operating deficiencies but primarily the prospect of not being able to cope with future demand under the existing organization.

Edmonton City Council required a number of concerns to be dealt with:

1. Given the present trend to involve the private sector in the provision of public service, it was important to demonstrate that the brokeage concept would indeed promote rather than reduce the private role.

2. The potential for accommodating increased demand without budgetary increase was a significant attraction for City Council as a means of satisfying demands from other disabled groups for transportation service without reducing the access of presently secured groups. Therefore a number of mid project audits and reporting requirements were included in the approvals for the project.

3. In the transition from one organization to another the interests of individuals especially the staff of the current contractor should not be jeopardized unnecessarily. Therefore Council instructed that staff working for the current contractor be given first consideration for employment.

4. As a service to the disabled, DATS should be an "affirmation action" employer and therefore DATS should seek to employ people from the disabled community.

The Custom Transportation Demonstration Project was also of interest to the disabled community. Organizations such as the Canadian Paraplegic Association and the DATS Advisory Council which had been set up to give the City feedback on the DATS operation, were active in promoting changes in the DATS operating structure. The disabled community had for a long time promoted the concept of a separate DATS authority. Although the authority concept was not accepted, the disabled community supported the "brokerage concept" as a positive step toward a more responsive system.

The private transportation companies such as the taxi firms and private bus operators also supported the "brokerage concept" because it offered an opportunity to expand their business operations which under the existing structure was not possible.

2.5 Summary

Because of a thorough evaluation of the future demand for services for the disabled and aged community, the City of Edmonton Transportation Department recognized that it was important to create a basic management structure now, which could respond to the potential growth in demand within an environment of increasingly restrictive municipal budgets. Factors of critical importance to this process of change were a good information base, the support of the user community, and the interest of the private transportation industry. As well the willingness of Transport Canada to support some of the cost of the innovative aspects was important in the decision of City Council.

3. DEMONSTRATION PROJECT IMPLEMENTATION

3.1 Introduction

Following approval by City Council on April 23, 1985, the project team concentrated on the transition from the existing mode of operation to a brokerage organization as proposed in the DATS Review and Brokerage Feasibility Study. Within a compressed timeframe: service tender specifications had to be drafted, proposals invited and contracts awarded; a brokerage centre with vehicle storage, scheduling and dispatch facilities and space for administration had to be established; a radio licence secured and a radio system procured; a fleet maintenance contract established; and administration, scheduling and dispatch positions filled. Following the approval of City Council ,the City of Edmonton Transportation Department retained the services of Louis G. Grimble Professional Engineer Ltd. and Manop Services Ltd. to assist the City Administration in the implementation and evaluation of the Custom Transportation Brokerage Demonstration Project.

This chapter provides an account of the activities leading up to the August 1, 1985 on-line brokerage implementation date and the activities and changes that characterized the actual demonstration project from August 1, 1985 to December 31, 1986. These activities are summarized on Figure 3.1.

The implementation phase of the Custom Transportation Demonstration Project provided the basis for the evaluation of the project and provided the operational experience upon which the post demonstration "Brokerage Organization" was defined and implemented.

3.2 Tendering of Service Contracts

Based on the analysis of service requirements conducted in the DATS Review and Brokerage Feasibility Study, four distinct service options were identified and subsequently four distinct service contract specifications were drafted and tendered. A summary of the four service options is provided in Table 3.1.

The operational strategy was essentially to transfer ambulatory registrants such as the blind and frail elderly to the sedan services. Productivity on the hourly charge sedan service was to be maximized through the scheduling of subscription or reccurring education, employment and theraputic trips during the weekday morning and afternoon peak hours. Productivity loses through trip cancellations were to be offset by scheduling non-subscription reservation type social, shopping or medical trips onto this service to fill the gaps. Those ambulatory trip requests that could not be fitted into the peak hour sedan schedules were to be assigned to the flat rate sedan service that was to be available from 0600 hours to 0030 hours, seven days a week.

Both subscription and non-subscription trip requests by wheelchair bound registrants were to be scheduled onto the lift-equipped service utilizing the City owned lift-equipped fleet operated by contract drivers.

According to City of Edmonton policies and procedures, all service contracts were processed and tendered by the Materials Management Branch of the Real Estate and Supply Services Department. All four contracts were advertised and tendered on a public basis. A public opening of the tenders was held on June 27, 1985.

The tender results are summarized in Table 3.2. In all cases the City accepted the lowest price tender and contracts were entered into with the respective companies. The hourly based contracts for the supply of drivers were awarded to one firm on the basis of a low combined bid for the two contracts. The contracts for the hourly based sedan service and the flat rate taxi service were awarded to one firm who had submitted the low bid on both contracts.

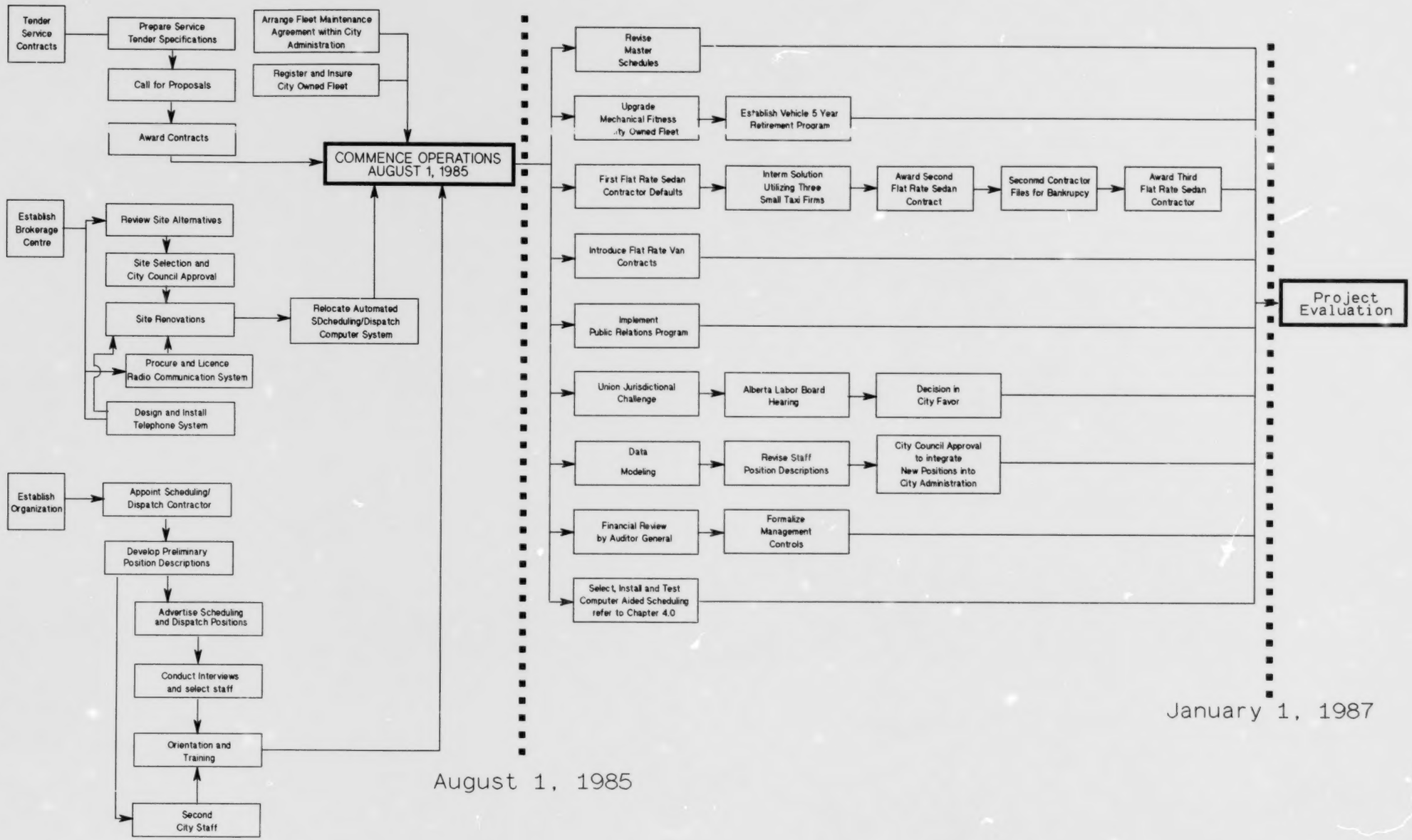

Tender Service Contracts
Prepare Service Tender Specifications
Call for Proposals
Award Contracts
Arrange Fleet Maintenance Agreement within City Administration
Register and Insure City Owned Fleet
COMMENCE OPERATIONS AUGUST 1, 1985
Establish Brokerage Centre
Review Site Alternatives
Site Selection and City Council Approval
Site Renovations
Relocate Automated SDcheduling/Dispatch Computer System
Procure and Licence Radio Communication System
Design and Install Telephone System
Establish Organization
Appoint Scheduling/ Dispatch Contractor
Develop Preliminary Position Descriptions
Advertise Scheduling and Dispatch Positions
Conduct Interviews and select staff
Orientation and Training
Second City Staff
August 1, 1985
Revise Master Schedules
Upgrade Mechanical Fitness ity Owned Fleet
Establish Vehicle 5 Year Retirement Program
First Flat Rate Sedan Contractor Defaults
Interm Solution Utilizing Three Small Taxi Firms
Award Second Flat Rate Sedan Contract
Seconmd Contractor Files for Bankrupcy
Award Third Flat Rate Sedan Contractor
Introduce Flat Rate Van Contracts
Implement Public Relations Program
Union Jurisdictional Challenge
Alberta Labor Board Hearing
Decision in City Favor
Data Modeling
Revise Staff Position Descriptions
City Council Approval to integrate New Positions into City Administration
Financial Review by Auditor General
Formalize Management Controls
Select, Install and Test Computer Aided Scheduling refer to Chapter 4.0
Project Evaluation
January 1, 1987

Figure 3.1 **Demonstration Project Implementation**

All tender specifications and subsequent contracts included:

- a clear statement of the relationship between the brokerage centre and the service contractor whereby the contractors would operate according to the schedules and dispatch instructions originating from the brokerage centre. Payment for service would be based on brokerage centre records.

- a three year duration from August 1, 1985 to July 31, 1988.

- a non-exclusive service clause that allowed the City of Edmonton to broker services effectively across contracts.

- a minimum guarantee ensuring a minimum number of hours per annum for the hourly charge contracts and a minimum number of trips per annum for the flat rate sedan contract (Table 3.1).

- a driver training clause which stipulated experience and or orientation in the proper transportation of the disabled.

- revenue collection and accounting, invoice payment, liability insurances, driver expectation, vehicle specification (where applicable - Table 3.1), labor relations, default and arbitation, clauses,service standards and performance bond criteria particular to City of Edmonton expectations and policy.

3.3 Arrangement Fleet Maintenance Agreement

Based on the findings of the DATS Review and Brokerage Feasibility Study, it was concluded that it was in the City's best interests to arrange for the maintenance of the City owned fleet within the City Administration. With the approval of City Council, the Transportation Department negotiated a fleet maintenance and fuel supply agreement with the Mobile Equipment Services Branch of the Real Estate and Supply Services Department. The agreement included a preventative maintenance program, propane and gasoline supply, road service and priority repair in the event of vehicle breakdown. A variable charge based on vehicle age, fuel requirements and distance was established.

3.3.1 Vehicle Registration and Insurance

As a consequence of the decision to service and maintain the City-owned vehicles within the City, the legal status of the vehicles had to be confirmed. Prior to the August 1, 1985, all City-owned vehicles had been licenced and insured by the contractor. With the assistance of the Risk Management and Security Branch of the City Finance Department, the Transportation Department had to arrange for personal liability and property damage insurance coverage for the fleet. Once the insurance was secured, the fleet of 41 vehicles had to be re-registered and new licences installed in the period between the completion of the contractor's contract at midnight July 31, 1985 and the 0600 hours start up time on August 1, 1985.

Table 3.1: SUMMARY OF SERVICE CONTRACTS FOR TENDER

CONTRACT	VEHICLES	CLIENTELE	CONTRACT GUARANTEE/FEE
Hourly Driver Drivers provided at hourly charge to operate City-owned vehicles (many-to-many service)	Municipally owned lift-equipped Mini Buses, School Buses and Vans	Wheelchair bound physically disable requiring lift-equipped vehicles	60,000 hrs/annum $/scheduled hour
Hourly Driver (ACT) Drivers provided at hourly charge to operate City-owned vehicles to and from major Recreational Centre for Disabled (many-to-one service)	Municipally owned lift-equipped Mini Buses, School Buses and Vans	Program registrants at ACT Recreational Centre for the Handicapped (3)	11,000 hrs/annum $/scheduled hour
Peak Hour Sedan (1) Driver and vehicle provided at hourly charge during peak hours	Privately Owned Sedans	Ambulant Physically Disabled	11,000 hrs/annum $/scheduled hour
Flat Rate Sedan (2) Driver and vehicle provided on rate per passenger trip	Privately Owned Sedans	Ambulant Physically Disabled	60,000 passenger $/one way trip

1. Contractor paid by the operating hour scheduled.
2. Contractor paid by one way passenger trip.
3. ACT Recreational Centre is a City operated centre offering programs for physically disabled adults and children and mentally handicapped persons and is located in a City park remote from regular transit service.

Table 3.2: SERVICE CONTRACT TENDER RESULTS
(tender prices in dollars and cents)

BID #	HOURLY DRIVER (Many-to-Many)		HOURLY DRIVER (ACT) (Many-to-One)		COMBINED HOURLY DRIVER BID		PEAK HOUR SEDAN	FLAT RATE SEDAN	
	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend		One Zone	Two+ Zone
1.	14.98	14.98	20.70	20.70	14.66	14.66			
2.	14.93	26.79	20.30	29.89	14.79	26.79			
3.	15.72	15.72	15.72	15.72			23.45	7.55	10.75
4.	19.98	19.98	19.98	19.98					
5.							12.75	3.50	4.85
6.							24.00	7.00	10.00
7.							17.50	12.50	18.00
8.			17.00	17.00				7.00	11.00
9.								7.00	11.00
10.								8.00	11.00
11.			22.15	33.25					

3.4 Establishment of Brokerage Centre

3.4.1 Location of Brokerage Centre

Initially four existing properties were considered as possible brokerage facilities. Two were privately owned while the remaining two sites were existing vacant City facilities. In the final site selection the following criteria were considered:

- Facility lease and renovation costs.
- Proximity to major arterials.
- Suitability for vehicle storage and light repair.
- Wheelchair accessibility.
- Optimization of existing City-owned facilities.

A suitable City-owned building located within the Davies Integrated Site on the City's southeast was selected and approved by City Council. Office accommodations were designed and constructed to meet the requirements of the scheduling and dispatch functions. In addition, space was made available for the brokerage administration and the contract drivers operating the City owned vehicles. Fleet maintenance was enhanced by location of a major Mobile Equipment Services facility within the Davies Integrated Site.

3.4.2 Telephone System

Two alternatives were considered for the telephone system;

- A one number system for all user calls; i.e. reservations, cancellations, and inquiries.
- A multi-number system with separate numbers for each user requirement.

In assessing the merits of a one number system versus a multi-number system, a key consideration was the simplification from the users point of view. Therefore a one number service was selected although a separate number for administration was also provided since the majority of users have little need to consult with the administrative personnel on a regular basis.

Initially six lines were installed for booking reservations and trip request information and four lines installed for administrative requirements. The number for the six line rotary system to serve the public was advertised widely as was one of the four numbers for the administration.

Each telephone set was restricted to specific lines depending on the function of that particular station.

An exclusive telephone line for the use of the dispatcher was also installed. This line had, in effect, an unlisted number and was accessed from only one telephone located at the dispatcher's station. It provided an unencumbered means for the dispatcher to contact emergency vehicles, fleet maintenance and dispatchers for the sedan and taxi contractors, etc.

3.4.3 Radio Communication System

A radio communication system was required for the dispatching of the lift-equipped vehicles owned by the City of Edmonton. Radio equipment was purchased from one of the previous contractors and arrangements made with the Federal Department of Communications to transfer the assigned transmission frequency. Because Edmonton does not have any serious terrain problems and because of the centrality of transmitters, communications requirements were not a critical component of site location.

3.4.4 Relocation of Existing Automated Scheduling System

Under the previous contract the trip reservation and schedules were processed using a computerized trip addition algorithm program. Remote terminals were located at the previous contractor's facility and connected to a host HP3000 mini computer located in the central Transportation Department administration offices. Since it was the intention of the Transportation Department to utilize the existing computer system until the new computer system was installed, arrangements to link the existing system to the new location were made.

On the evening of July 31, 1985 the terminals and modems were transferred from the previous contractor's facility to the new brokerage centre and connected to the host HP3000.

3.5 Establishment of Brokerage Organization

To ensure the flexibility required to respond to on-line operational experience during the eighteen month demonstration project, an administrative organization incorporating seconded City staff and contract scheduling and dispatch staff was established (Figure 3.2).

3.5.1 City Staff

Existing DATS administrative staff and transportation planning staff were seconded to the demonstration project for the eighteen month period to facilitate project management, operational supervision, contract administration, project and service monitoring, and to maintain ongoing coordination of patron registration and public relations. The four individuals were assigned on a temporary basis pending the definition of required position descriptions from experience gained during the course of the demonstration project (Figure 3.2).

3.5.2 Appointment of Scheduling and Dispatch Contractor

The brokerage scheduling and dispatch functions were contracted to Louis G. Grimble Professional Engineer Ltd. based on the following considerations:

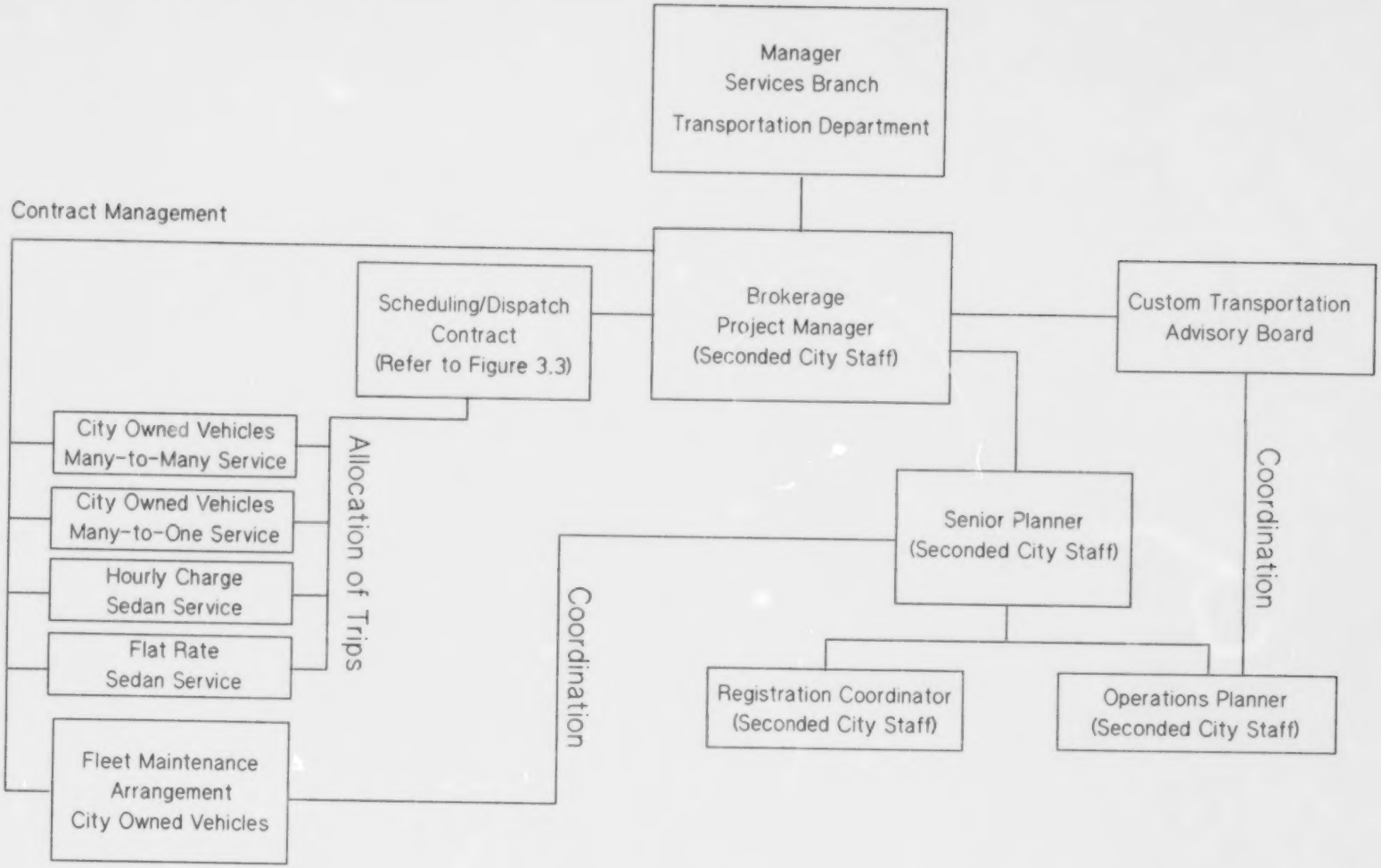
- To overcome a lack of required in-house scheduling and disptach expertise and the imposition of a City hiring freeze policy.

- To ensure flexibility in the testing of alternative position descriptions, functions and reporting structures during the demonstration project.

The timeframe for the Scheduling and Dispatch Contract was July 1, 1985 to December 31, 1986. This timeframe permitted the appropriate booking, scheduling and dispatch staff to be hired and gave the City the opportunity to define appropriate position descriptions based on operational experience and to integrate subsequent position classifications into the existing City of Edmonton administrative structure.

3.5.3 Scheduling and Dispatch Staff

Upon the approval of the demonstration project and the appointment of Louis G. Grimble Professional Engineer Ltd. as the scheduling and dispatch contractor, trip booking, scheduling and dispatch positions were posted. Interviews were conducted in the latter part of May, 1985 and appointments made. The



DATS3.2

Figure 3.2 Initial Brokerage Organization

initial organization of the scheduling and dispatch unit is illustrated in Figure 3.3 Individuals with experience with the previous contractors were hired to fill key positions. This reinforced a smooth transition from the previous mode of operation to the brokerage system. The supervisory position was filled with an individual with approximately fifteen years experience in the Edmonton taxi industry.

3.6 August 1, 1985 Implementation

At 0600 hours on August 1, 1985 the Brokerage Centre went into an on- line operational mode providing service to physically disabled persons. The tenure of the previous contractors expired at 0030 hours July 31, 1985. Computer terminals and vehicles were delivered to the new facility the evening of July 31. Vehicles were delivered as they came off the evening shifts. The computer terminals were hooked up and tested. Schedules produced by the previous contractors for August 1 were assigned to the new contractors.

3.6.1 Revision of Master Schedules

During the initial period of operation, brokerage scheduling staff found it necessary to revise the master or subscription trip schedules provided by the previous contractors. These revisions were necessary to accommodate patron address changes, the address of the new brokerage facility and the deletion of patrons who had previously cancelled their service. In certain cases outdated schedules were still found to include deceased patrons. From these required changes it was evident that certain drivers under the employ of the previous contractors had failed to notify their employers and/or the City of service cancellations. This omission was possibly in response to drivers fears of losing their assigned routes through client cancellations.

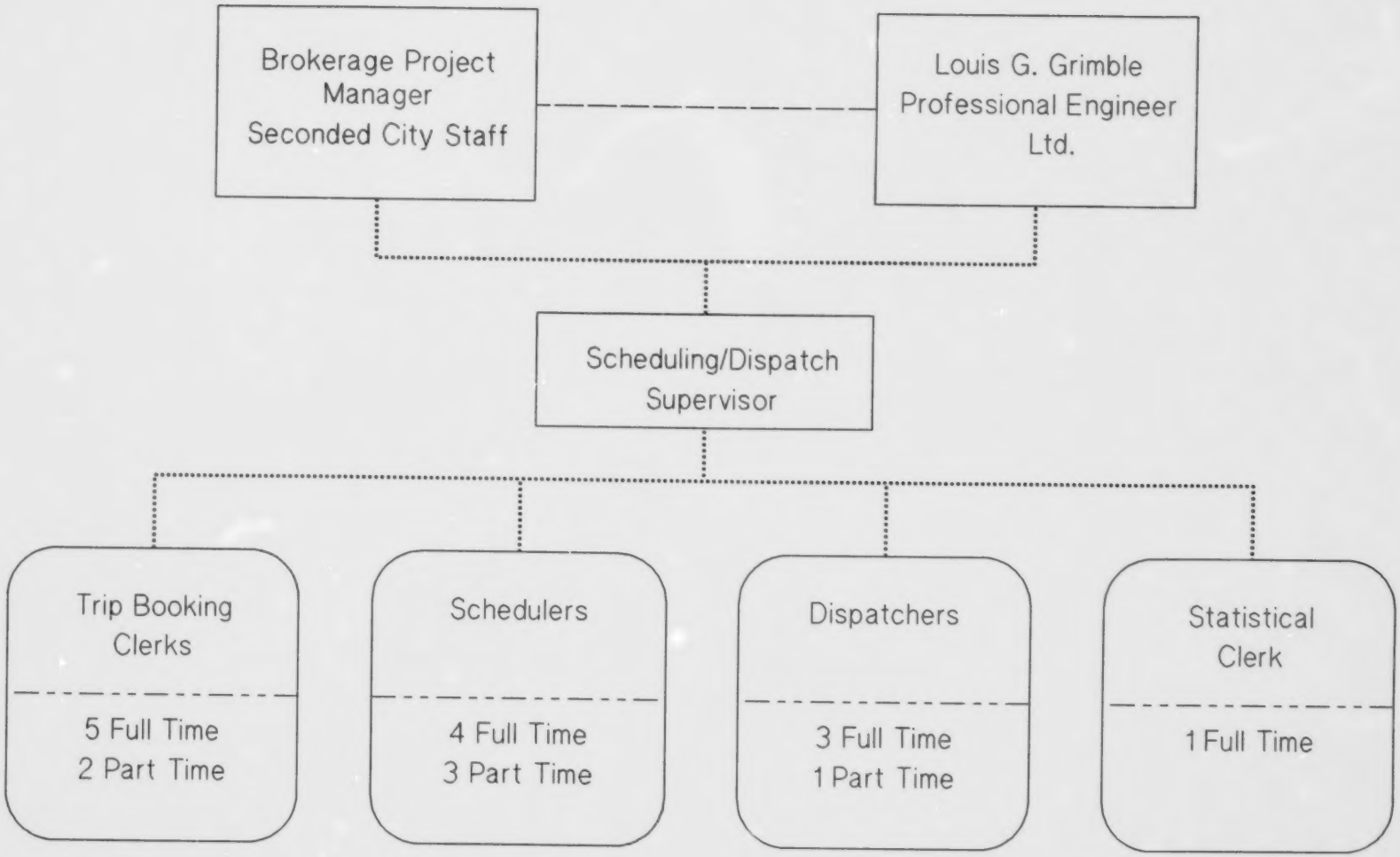
3.6.2 Information Management

Prior to August 1, 1985 contract invoices were based on an hourly rate with each contractor subject to a budget ceiling per month. Since trip information was not central to the contract, although it was critical for the City's planning and analysis, trip information was not maintained in detail. The lack of detailed and verified trip information created problems later in the evaluation.

In the implementation of a brokerage organization, trip information is vital for planning and analysis, and for contract administration purposes with respect to revenue reconciliation and invoice processing. It became apparent early in the demonstration project that the methods used under the pre-brokerage contracts were not sufficient. More rigorous recording of trips, cancellations, and transfers had to be instituted to provide an audit trail for the reconciling of accounts. Therefore, several changes in the trip and statistical record keeping formats were made to cover the period until implementation of a new computer program which would incorporate statistical reporting functions.

3.7 Fleet Upgrade

In the five years preceeding the implementation of the Custom Transportation Brokerage Project, the City of Edmonton had failed to honor a fleet retirement program. As a consequence some of the 41 City-owned lift-equipped mini buses were 10 years old and the majority were beyond the generally accepted five year maximum age for vehicles of this size and use.



DATS3.3

Figure 3.3 Initial Scheduling/Dispatch Unit Organization

During the first month of the project, a major repair and maintenance program had to be undertaken to ensure the mechanical fitness and service reliability of the fleet. Because of the initial condition and age of the fleet, service reliability suffered because of frequent breakdowns.

Service reliability was further enhanced by the procurement of twenty-one lift-equipped vans during 1986 to replace older vehicles in the fleet. Currently there are 37 vehicles in the City-owned fleet of which two vehicles are maintained specifically as spares. By mid 1987 it is expected that the fleet will have been upgraded such that no vehicle will be greater than five years of age and the fleet will be managed on a five year retirement basis.

3.8 Contractual Problems with Flat Rate Sedan Contract

The flat rate sedan service was contracted essentially to provide a service option for the discretionary assignment of trip requests made by ambulatory registrants that could not be assigned to existing hourly sedan or lift equipped vehicle schedules. By contractual arrangement, the contractor was to be provided daily with a list of trip requests ordered sequentially by assigned pick up time. These trip lists included the patrons name, pick up address and time, and drop off address and time. Trip cancellations and on- demand trip requests were communicated daily by the Custom Transportation Brokerage dispatcher by telephone to the contractor's dispatcher. It was then the responsibility of the contractor to organize the trips in a productive manner for the participating drivers. It was also the inital understanding that the contractor would recruit a core of drivers who were willing to participate and who were familiar with the DATS service standards and trained to provide transportation for the disabled.

Initially the flat rate contract was awarded to one of the largest taxi firm operating in Edmonton. At the time the firm had extensive City-wide coverage with over 600 company owned or owner-operator vehicles operating under licence. Problems in service became apparent within the first week of operation. Approximately 80 to 100 trips were assigned daily to the flat rate contractor. This allocation was eventually reduced and withheld entirely when it became apparent that contractor could not fulfill his contractual obligation. Service was further disrupted by a labor problem related to a number of issues between the taxi operators and the contractor.

In reviewing the performance of the contractor on its DATS contracts a number of problems were identified.

- The contractor had failed to recruit and train a core of drivers willing to participate at the accepted bid price and was dispatching DATS trips to all available taxi drivers.

- The contractor failed to organize the DATS trips for the drivers to ensure adequate productivity and financial return for the taxi drivers.

As an interim solution, short term agreements were made with two small taxi firms and a limousine firm who had originally bid on the flat rate contract. In accordance with the individual agreements, the DATS trips were assigned based on different criteria. For example one firm could only handle trips in offpeak hours while another firm could only handle trips originating on the north side of the City. This arrangement proved to be too complex to coordinate and ensure an equitable allocation of trips by the Custom Transportation Brokerage Centre. [1] In addition, the individual contractors found the number of trips too few to assign to their drivers in a productive manner.

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[1]. Two-way trips as requested by DATS registrants could not be assigned strictly by geographic region or within specific timeframes as trip destinations were often outside the zone of origin and return trip times could be within the peak hours and hence not acceptable to a particular contractor.

In November, 1985 the terms of the flat rate sedan contract were negotiated with a small local limousine service that specialized in airport limousine services, senior citizen services and airline flight crew shuttle services. This particular firm had participated in the interim service arrangement noted above. Changes to the original flat rate contract included the removal of a minimum annual trip guarantee and the replacement of a two price system based on distance to a flat rate pricing system based on weekly trip volumes instead of trip distance.

The limousine firm dedicated from between four and six company sedans to DATS trips and utilized company employed drivers.

Although this arrangement remained in effect until mid October, 1986 when the firm suddenly filed for bankruptcy, there were continual problems related to the size and mode of operation of the contractor. These were:

- The daily fluctuations in trip volumes ranging from 40 to 150 trips/day could not be adequately accommodated through the use of hourly paid employee drivers. At times there were insufficient trips to keep the employees productive.

- DATS trip volumes also varied by time of day. Because of the contractor's size, it was difficult to accommodate more than 15 trips at a given hour.

- The contractor also did not have sufficient capacity to serve all their clients. The City found that the DATS trips tended be serviced late or go unserviced if the contractor had one or more vehicles held up at the airport waiting for a airline flight crew on a late arrival.

Prior to the second flat rate sedan contractor filing for bankruptcy, the City was in the process of reviewing service quality problems with the contractor and was considering breaking the second flat rate contract due to non-performance.

In late October 1986, another large taxi company in Edmonton was approached to provide flat rate sedan services. An interim arrangement was secured while a case study analysis was undertaken to determine a fair market flat rate charge. Figure 3.4 provides a summary of the two week case study analysis during which data was collected by the taxi company on the meter charges actually run to service DATS trips.

From this analysis the City and the taxi company negotiated a flat rate price that was both acceptable to the City of Edmonton and the owner-operators working under the company's colours. The final set price effective to July 31, 1988 was $8.50 per one way passenger trip to which the taxi company applied a ten percent discount on monthly charges. The current flat rate sedan contractor has also recruited an adequate pool of trained drivers to participate in the service and by December, 1986 the contractor was successfully accommodating from 150 to 200 one way passenger trips per day.

3.9 Introduction of Flat Rate Van Contracts

In November, 1985 the potential of flat rate passenger van services was identified. Initially flat rate passenger van services were introduced on a trial basis to provide a many-to-one subscription service for ambulatory registrants enrolled in specific occupational or recreational programs. In addition, the flat rate passenger vans were utilized for group bookings. For example, a passenger van could be used to transport eleven residents from a nursing home to a concert. In this type of application, the City realized operating cost savings by paying private van operators on a per-patron carried basis and did not have to absorb the unproductive dead-heading or layover charges associated with hourly charge contracts.

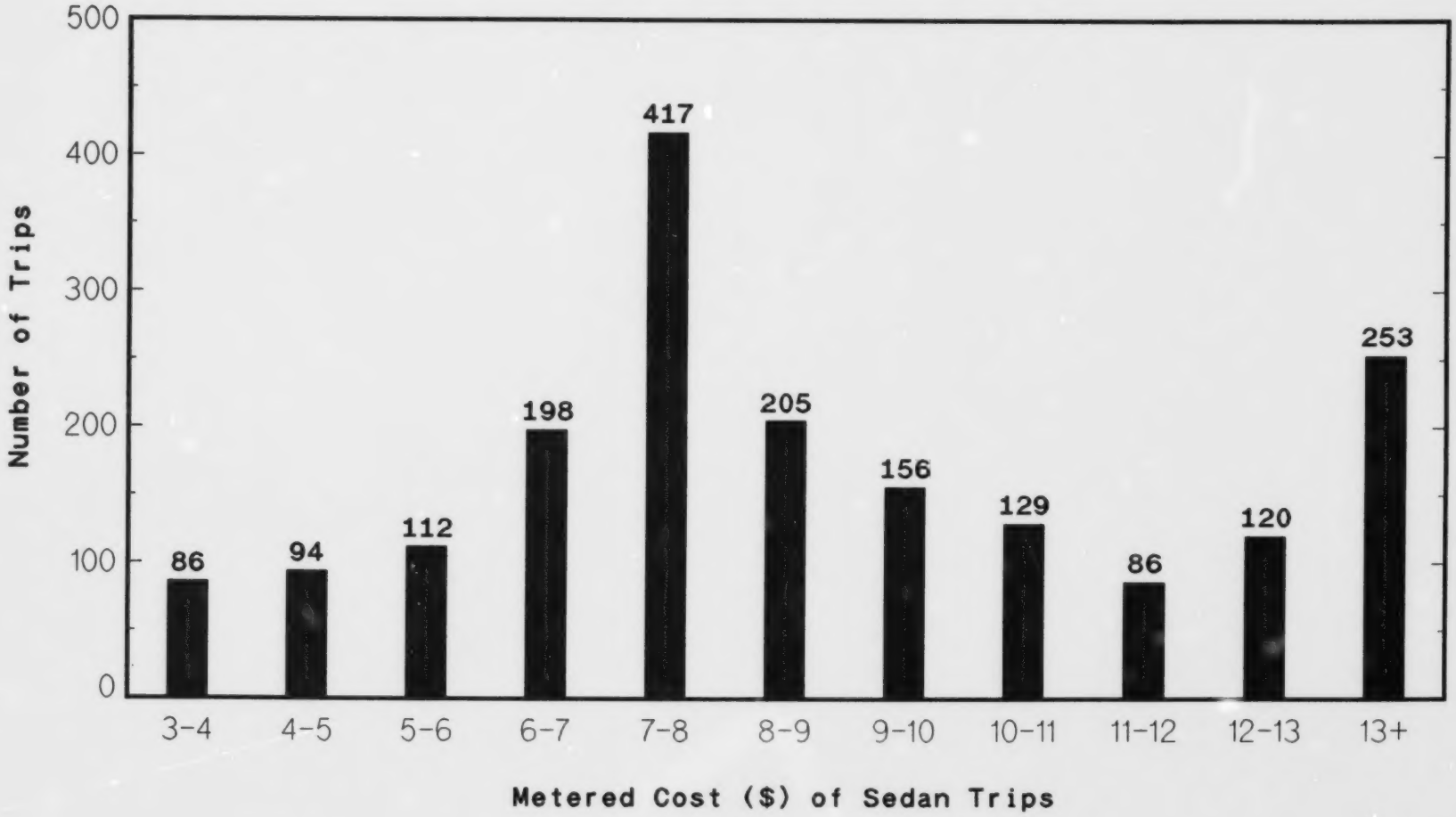

Figure 3.4: Results of Case Study Analysis to Determine Fair Market Flat Rate Charge for DATS Sedan Trips

DATS13.4

By October 1, 1986, 12 formal flat rate passenger van contracts had been awarded. Nine of these contracts were with independent owner-operators while three were with local taxi firms with numerous vans at their disposal. Seven of these contractors are also providing a flat rate wheelchair service with converted vans. Regular subscription service routes, group bookings and single wheelchair trips are assigned on a rotation basis. The flat rate van prices in effect from October 1, 1986 to September 30, 1987 are $4.25 and $4.50" per one way ambulatory passenger trip and $10.00 per one way wheelchair passenger trip. These fixed flat rate prices are based on a minimum guarantee of five passengers per assigned route.

3.10 Implementation of Public Relations Program

3.10.1 Consumer Involvement

Prior to the August 1, 1985 implementation, consumer involvement in the planning and initial implementation of the Custom Transportation Brokerage Demonstration Project was facilitated through a Consumer Task Force with representation from the DATS Advisory Council, the Regional Action Group of Edmonton and the Canadian Paraplegic Association. During the first eight months of the demonstration project, consumer review and feedback was formally facilitated through the DATS Advisory Council. This Council was replaced by a more formalized Custom Transportation Services Advisory Board established by City Council through Bylaw #7842. Members of the Advisory Board included DATS patrons, representatives from various institutions and organizations representing or serving physically disabled persons and citizens-at-large drawn from the general public. The Advisory Board was further organized into sub-committees focusing specifically on scheduling, eligibility, safety and service policy issues.

3.10.2 Patron Information

To minimize the impact of change resulting from the project implementation, a public information program was developed. The public information program was designed to notify service patrons of the introduction of new contractors, procedural and policy changes, and improvements in service. The program included a mailout quarterly newsletter, media releases, information handouts on the vehicles and staff presentations at group homes, nursing homes and organizations. An administration telephone number separate from the trip reservation number was maintained for telephone inquiries. Following the project completion, a revised information brochure will be produced and circulated to all current patrons and provided to new patrons upon registration.

3.10.3 Complaint Investigation and Review

A formal complaint reporting and investigation procedure was also established which eventually included a full time staff member for the receipt and investigation of complaints. Complaint information was subsequently used to refine policies and procedures and in some cases retrain staff. Monthly complaint summaries are currently maintained as part of the ongoing monitoring and evaluation program.

A byproduct of the centralization of the scheduling and dispatch functions and their separation from the service contractors was an improved recording of all complaints and user problems. The number of recorded complaints increased substantially, principally because all complaints were now being recorded and acted on under the previous arrangement. The centralization of complaints has permitted the system to be more responsive.

3.11 Union Jurisdiction Challenge

On August 3, 1985 immediately after the Brokerage Centre began operations the Amalgamated Transit Union (A.T.U.) Local 569 served notice with the Alberta Labour Relations Board, that it wished the Board to decide on whether the A.T.U. had the rights of succession to the employees of Diversified Transportation Services Limited, the contractor for the hourly based driver contracts, and Louis G. Grimble Professional Engineer Ltd., the contractor for the scheduling and dispatch office, as a result of an existing collective agreement with the former contractor. Secondly, it requested the Board to determine whether DATS was part of the City of Edmonton Public Transportation system and was therefore included within the collective agreement between City of Edmonton and the A.T.U.

The Board undertook its own investigation of the facts of the matter, held hearings and received representations from the respective parties in November of 1985 and rendered a decision in January, 1986. Three central issues were reviewed during the hearing progress.

3.11.1 Issue 1

The A.T.U. application claiming jurisdiction over all aspects of the DATS operation was based on a clause in the existing collective agreement with the City which held that the A.T.U. certification applied to, "All employees engaged in the operation, service, and maintenance of the Public Transportation System including ..."

In rendering its decision the Board debated the scope and definition of the term "The Public Transportation System". It was noted that at its broadest, this term could include almost any conveyance used to transport the public.

This the Board rejected. It also debated whether the type of vehicle used defined the term Public Transportation System. It also rejected this definition. In its decision the Board determined that for the purpose of defining the scope of the Certificate of the A.T.U., that the following should apply:

"...the term "Public Transportation System" connotes the conveyance of passengers by a variety of vehicles operating on roads or rails, that are available on request or at a pre-determined time and at either requested or pre-determined locations, to any member of the public able to pay the required fare. On this basis transportation for the disabled would not be public transportation because service is not generally available to the public, rather it is limited to those who have qualified and are registered as users of this service. The fact that the vehicles themselves are specially adapted to meet the needs of the disabled is not an influencing factor..."

This decision should be noted by those who are providing service and considering how it should be structured within the administration of the municipality. Clearly if the objective is to maintain flexibility in the system and to release it from conditions governing the traditional transit service, it is important to maintain the qualification of, and the registration of users as a pre-requisite for service.

3.11.2 Issue 2

The second issue before the Board was the claim of A.T.U. to succession rights in the change of contract from one supplier to another contractor. The Board held that in fact because there was no relationship between the previous contractor and the new contractor that no transfer of business took place even though some of the employees moved to the new contractor. This decision effectively provides the opportunity for the contracting of service to various parties without incurring the liability of the previous contractor. Any

change of contractor however, must meet the test of independence of the successor contractor from the original contractor. This decision however, does not explicitly deal with the problem of succession rights where services previously provided in-house are contracted out.

3.11.3 Issue 3

The third issue of importance raised by the A.T.U. application was the issue of common employer status. The A.T.U. contended that in fact the City and the contractor constituted a common employer and therefore any existing agreement with the City should apply to the contractors as well. Since the A.T.U. already had an agreement with the City for regular transit, the A.T.U. contended that this contract by common employer relationship should include DATS as well.

The Board ruled that each of the contractors, although working within the guidelines and policies dictated by the City, was in fact independent and in fact had normal control of their operations separate of each other. This decision is a critical one for implementation of a brokerage operation. The economies and benefits of "the brokerage concept" i.e. distributing trips to different contractors to match service requirements, can only be achieved if the broker has the opportunity to select the most productive supplier. This implies that different suppliers are prepared to provide competitive prices in specified areas where either their vehicles or expertise give them an advantage or specialization. If a common employer requirement were imposed, it is likely that the cost differences between alternative suppliers would be reduced negating one of the benefits of the brokerage concept. As well, independent contractors would be reluctant to bid on such services if by so doing their total operations were constrained by the labour conditions governing the party contracting out the services.

3.12 Data Modelling and Revised Organization

The organizational structure developed for the "brokerage concept" was in part a by product of a systems research process call "Data Analysis". The purpose of the process was to identify the "data" requirements from a business point of view (ie. "business of DATS") in order that an orderly development of computer systems could take place. As part of the "Data Analysis", the business functions of the organization had to be identified. The resulting product, called and "Enterprise Model" (reference Strategic Data-Planning Methodologies, by James Martin, 1982), provided two benefits. First, it was used as a framework for the Data Analysis. The second benefit was that it provided the data for designing an organization from a business functional point of view.

The "Data Analysis" process provided additional benefits to the implementaiton of the "brokerage concept". The second part of data analysis is "Data Modelling". This is a structured process for defining the objects of interest to an organization called "entities", describing their characteristics called "attributes", and determining the relations between them. In the data modeling excercise, the relationship between data and the business functions is analysed in detail. Once an organization is analysed in these terms, information requirements, job descriptions and reporting relationships can be determined. Data modelling or similar process can be a useful tool in the implementation of the "brokerage concept" and as well in the transition of an operation from one type of system to another, i.e. from a manual system to a computerized system. Because the brokerage concept for paratransit services involves a great number of transactions, it requires good record tracking or it can quickly become an adiminstrative burden. Data modelling can be useful in defining the information flows.

One of the consequences of the data modelling exercise was to introduce a stronger administrative component. The "brokerage system" developed for DATS not only increased the number of contracts to be administered but also increased the services purchased from other City departments. Therefore, one staff position originally conceived as a planning function became a support services function.

On September 23, 1986, approval was given for incorporating the new brokerage organization within the Transportation Department effective at the conclusion of the Demonstration Project December 31, 1986. This revised organization is summarized in Figure 3.5.

3.13 Financial Review and Control System

When the Custom Transportation Brokerage Demonstration Project was approved on April 23, 1985 City Council requested that an independent audit of the project performance be conducted by the City of Edmonton Auditor General's Office. On May 27, 1986 City Council amended their original request to read:

> "That an Audit for that period August 1, 1985 ending July 31, 1986 be prepared and compared to an Audit of the previous one year period August 1, 1984 to July 31, 1985. This report to be submitted to the September 16, 1986 meeting of the Public Affairs Committee".

Staff from the Auditor General's Office conducted an audit of ridership figures and financial statistics for the period of brokerage operation from August 1, 1985 to July 31, 1986. Raw data for this audit was taken from daily schedules produced by the Brokerage Centre and accounts payable information. For the prebrokerage period from August 1, 1984 to July 31, 1986, the data was derived from monthly ridership summaries and invoices provided by the previous contractors. Since this data was generated by third parties, it was not possible to verify or audit the method or basis for the statistics to ensure they were comparable to the data generated from August 1, 1985 to July 31, 1986. Since this was the only data available, the audit data was utilized in the evaluation of the demonstration project (Chapter 5).

In addition, staff from the Auditor General's Office also advised on procedures for improving the fiscal control system. In the fall of 1986 the financial management control system was revised with support from the Transportation Department's Financial Section. Daily operational reports summarizing the number of trips scheduled, cancelled, tranferred, added as on-demand requests and actually carried by contractor were utilized along with a daily record of hours scheduled to provide a cumulative summary report that permitted a weekly indication of budget adherence to established service levels as predetermined by budget cash flows. Subsequent adjustments in operating hours for the hourly contractors and in trip allocation for the flat rate contractors could be made within the scheduling and dispatch unit. This ridership data in conjunction with financial data from the City's Financial Information System (F.I.S.) provided the basis for the monthly performance reports.

The daily ridership reports are a product of the DATS Computer-Aided Scheduling System (Chapter 4) while the cumulative operational and financial statistics are maintained and produced utilizing existing Lotus software and a Sperry micro.

3.14 Installation of DATS Computer-Aided Scheduling System

On October 27, 1986, the DATS Computer-Aided Scheduling System, as supplied by Productivity System Inc., was incorporated into the service. The process of system selection, customization, installation, debugging and testing is detailed in Chapter 4.

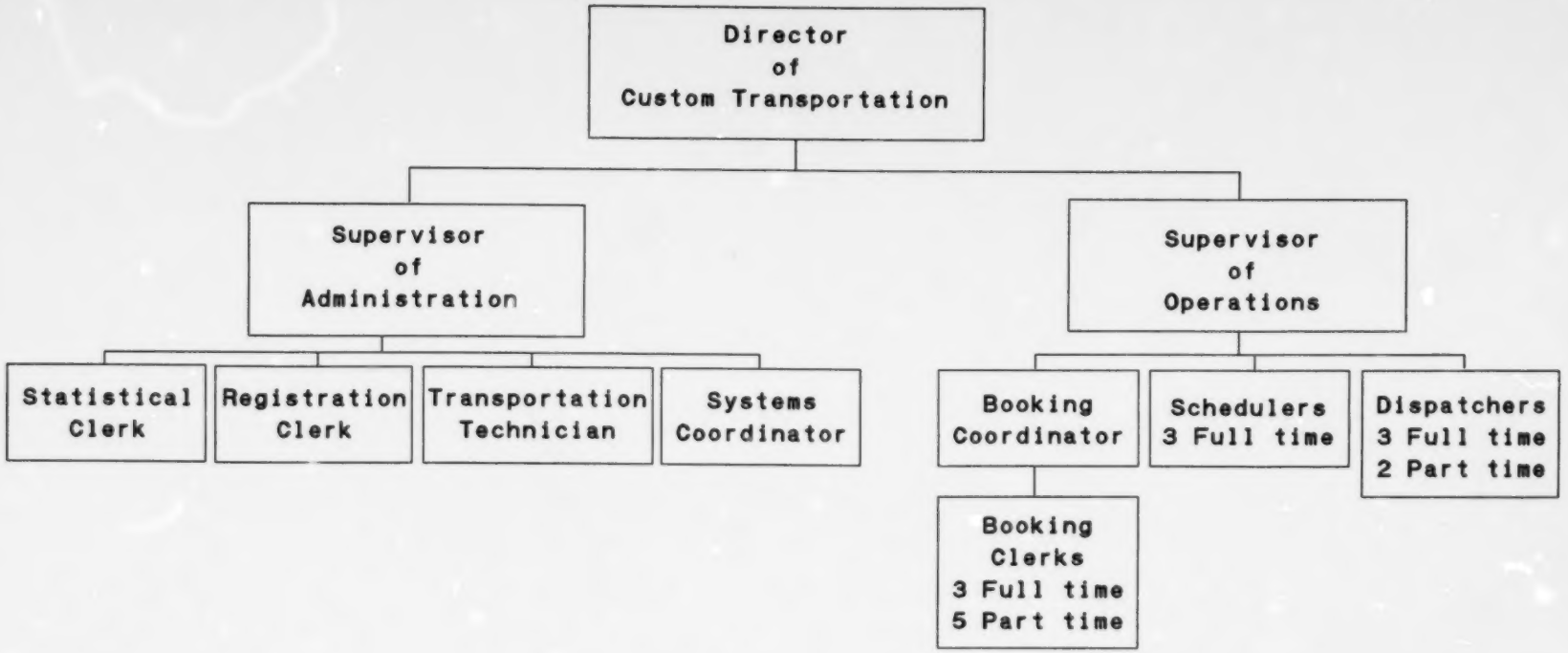

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Figure 3.5: Revised Organization

3.15 Summary

An account of the activities leading up to the August 1, 1985 on-line brokerage implementation and the events and changes that occurred during the course of the demonstration project has been provided in Chapter 3. The experience during this implementation phase provides the basis for the project evaluation as documented in Chapter 5.

4. COMPUTER-AIDED SCHEDULING SYSTEM

4.1 Introduction

The objective of introducing a new computer system was to provide a better tool to complement and coordinate the functions of the "brokerage management concept."

Prior to and during the first year of the brokerage operation, a computerized scheduling system developed by Edmonton Transit was used. This system known as the DATS Scheduling System incorporated an automatic scheduling function known as the Trip Addition Algorithm and ran on an HP3000 minicomputer located within the Transit Computer Centre.

A decision to replace this system with new computer hardware and software was based on a review of the existing system by TransVision Consultants Ltd.. The conclusions of their report DATS Computer Scheduling System: A Review and Analysis are summarized in section 4.2 of this report.

A call for proposals for the new system was initiated as part of the Demonstration Project. The objective of the proposal call was to select a tested off-the-shelf system which could accommodate the specific demands of the "brokerage management concept" through customization rather than through original development.

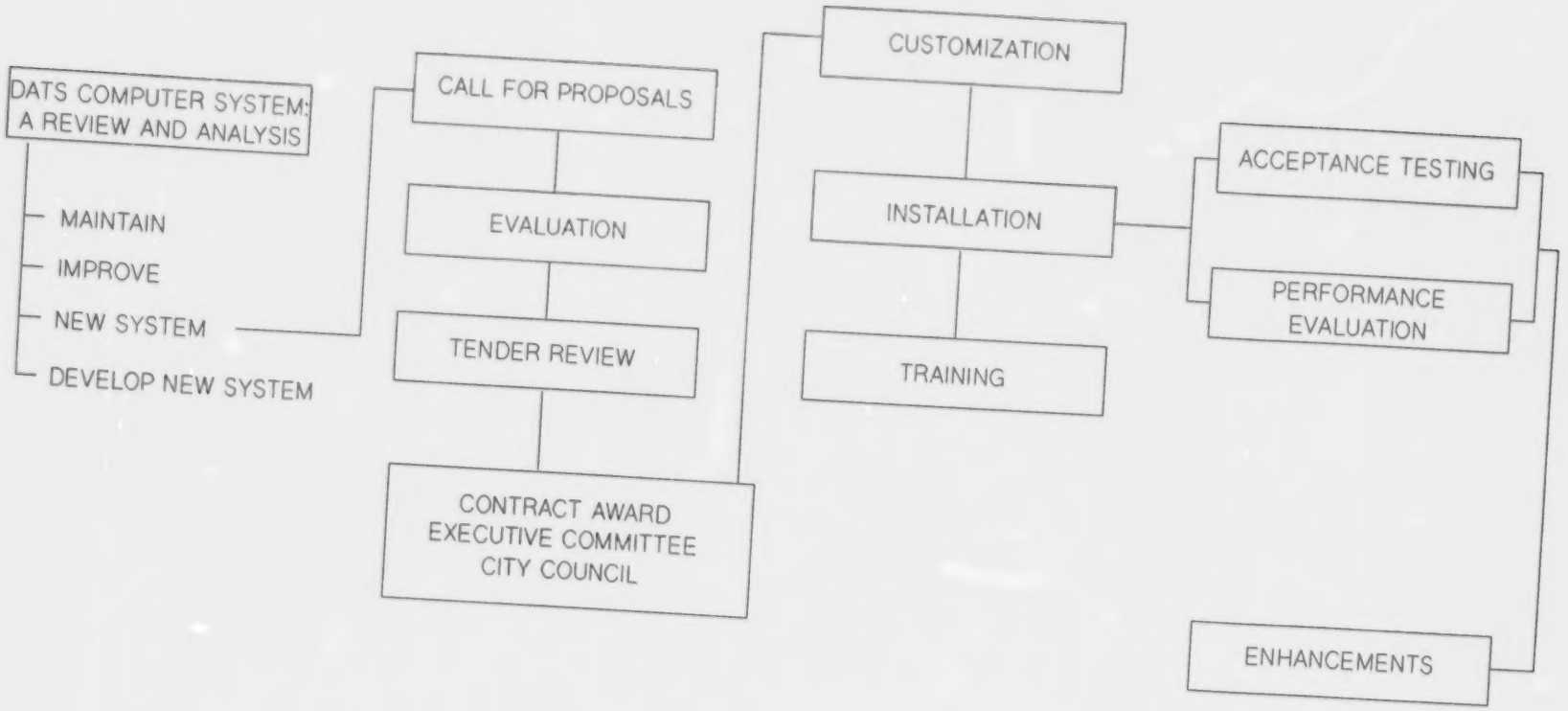
This chapter, as summarized in Figure 4.1, outlines the process of selection and evaluation of a new system. It identifies the tendering process, provides an evaluation of the selected system after six months of operation, and describes some of the future enhancements being developed to further tailor the system to the "brokerage management" functions.

4.2 Review of Existing DATS Computer Scheduling System (DATS Trip Addition Algorithm)

Prior to the incorporation of a new computer system, DATS utilized a computer program (the DATS Trip Addition Algorithm) developed by Edmonton Transit. This system was an automatic scheduling program which prepared schedules for all lift-equipped City-owned buses and for peak hour sedan services. The scheduling algorithm generated route assignment options based on an optimization of travel times. A master schedule for each day provided the basic route system from which the program could select options. Three options were generated by the program from which the scheduler could pick an assignment. As trips were entered, the program would continually adjust client pick up times within a fixed set of time parameters. Once the processing of trips was substantially complete, reservation trip pick-up times were confirmed by calling back each client. The system had been designed as an on-line, real-time reservation and scheduling system, but due to slow response rates and other problems in its scheduling parameter, it could not be utilized effectively.

To accommodate the limitations, operating procedures were introduced which utilized only specific parts of the program. For example, since the program maintained on-line information about registrants, this information was called up by the reservation clerks to assist in booking trips and identifying user information. The reservation requests were not directly entered into the program but were manually recorded onto cards and batch entered later into the scheduling algorithm.

A review of the system documented the problems and alternative courses of action. Tables 4.1 and 4.2 outline the major problems and alternative courses of action identified in the review, DATS Scheduling System: A Review and Analysis.



DATS14.1

Figure 4.1 Computer Aided Scheduling System

TABLE 4.1 PROBLEMS IDENTIFIED WITH DATS SCHEDULING SYSTEM

PROBLEM	COMMENT
Limited management report generation capability:	Since only hourly based contract services could be entered into the program, trips assigned to other contractors had to be tracked manually. Since no comprehensive trip database was available on the computer, statistical records and accounting records had to be prepared manually from hard copy records such as reservation cards, dispatch records, cancellation forms, etc.
Slow response time:	Because of the program design and because the program the program was run on an HP3000 located remote from the site and shared by other users, response time was too slow to operate the program as an on-line reser-and scheduling tool. For example, processing times of from several minutes to over 15 minutes were experienced.
No scheduler override:	Schedulers could not introduce trips manually onto a manually onto a route. The program would only accept trips which fitted into its preprogrammed scheduling parameters which were time based. Therefore, routes would be logical in time but illogical in terms of geo graphical distribution.

TABLE 4.2 ALTERNATIVES FOR COMPUTER

ALTERNATIVE	COMMENT
1. Maintain Existing System	.Host computer, HP3000, was under review for phasing out. .Existing limitations.
2. Improve Existing System	.Required significant dedication of computer staff resources. .Results not assured.
3. Obtain New System	.State-of-the-art hardware and programs tested by others could be obtained. .Performance improvement could be achieved in short term.
4. Develop New System	.Offered benefit of a tailored product but time frame, cost, and performance consequences could not be assured.

A decision to pursue the alternative "Obtain New System" was made based on the consideration that this alternative provide DATS with:

- An exclusive system directly controlled by DATS personnel.
- The opportunity to purchase a state-of-the-art system and take advantage of advances in technology and the experience of others in testing other systems.
- A system better suited to the management needs of the "brokerage concept."

However, it was also recognized that the DATS Automated Computer Scheduling System and Trip Addition Algorithm even with its limitations represented one of the few operating automatic scheduling systems in Canada or the USA and had the potential to be redeveloped and reintroduced when the need for and the opportunity for such an application could be demonstrated. Therefore, the existing DATS Scheduling System has been archived by the City of Edmonton until its attributes can be reworked to provide a building block for possible enhancement to the new system.

4.3 Call for Proposals and Selection

Based on a review of computer applications for paratransit systems done for the Computerization/Brokerage Demonstration project undertaken by B.C. Transit, potential suppliers were identified. The call for proposals was to select bidders whose systems had a demonstrated application and whose systems could be customized to meet the specific requirements of the "DATS brokerage management concept."

Tables 4.3 and 4.4 outline the general functional specifications and evaluation criteria generated for evaluation of the proposals.

TABLE 4.3 FUNCTIONAL SPECIFICATIONS

FUNCTION	CRITERIA
Client Registration	15,000 individual client files
Trip Reservation	1,000 subscription trips per day 1,000 non-subscription trips per day 200 cancellations per day
Trip Scheduling	2,000 trips per day
Operations Monitoring	2,000 trips per day 75 vehicles daily, monthly and annual operating statistics

TABLE 4.4 EVALUATION CRITERIA

CRITERIA	COMMENT
Cost	Cost was a priority given fiscal constraints of the City and project budget limitations. Benefits had to bear relationship to cost.
Applicability to Brokerage Framework	Program had to incorporate management reporting functions to track trips not only for statistical evaluation of system performance but also for accounting control over contractors.
Technical Evaluation	Systems were compared on basis of performance . response time for data retrieval for each function: i.e. registration, trip reservation, trip scheduling. . capacity. . user friendliness and ease of use. . scheduling aids proposed. . report routines.
Political Saleability	System had to demonstrate cost effectiveness and reasonable assurance of successful implementation.
Implementation Schedule	System could be installed in 1986.
Existing Application	System had to provide reference to an existing system or an application sufficiently similar to confirm that implementation would not require signficant redevelop ment or new development.
Universal Potential	Potential for system to be applied to other paratransit operations.

4.4 Tender Review

Three tenders were received. Each system incorporated different approaches especially toward the scheduling functions. The costs of the systems varied substantially with a differential between the lowest tender and highest of approximately eight (8) times. All tenders either had their systems in operation or were implementing an operation at the time.

The three systems proposed three very different approaches to the application of computer tools to scheduling. The least complex system utilized a database manager to assist the scheduler by producing time ordered and zone ordered lists of trip requests. The schedulers then assigned route numbers to each trip and entered the route assignments into the database manager which then created trip files and driver runs sorted by route number and time. A second system was based on a combination of a database manager with a graphic display of trip requests. By viewing the geographical distribution of trips along with requested pick up times on a display monitor, the scheduler could assign trips to routes and obtain feedback from the computer on the time consequences of the proposed schedule based on a time travel matrix

built into the program. The third system proposed a built-in automatic scheduling algorithm which could directly generate schedules from a zoned list of trip requests. As well, this system permitted schedulers to override any system decision with a manual route assignment.

A comparative review of the relative benefits of the three tenders in relation to the evaluation criteria and in relation to each other is illustrated on Table 4.5. The matrix represents a summation of the written reviews of each of the proposals and is not intended as an objectively derived or weighted evaluation methodology.

If weighting were applied to the criteria, cost considerations would have represented the most significant variable.

TABLE 4.5 TENDER COMPARATIVE RANKING

EVALUATION CRITERIA	TENDER 1	TENDER 2	TENDER 3
Cost/Budget Limits	5	3	1
Applicability to Brokerage Framework	4	2	2
Technical Evaluation	3	4	4
Political Saleability	4	2	1
Implementation Schedule	4	1	1
Existing Applications	5	2	2
Universal Potential	5	4	2
TOTAL	30	18	15

Evaluation rating 1 (lowest) to 5 (highest).

4.5 Description of Selected System (System Configuration)

The selected system was developed by Comshare Limited of Toronto and had been successfully implemented in the Hamilton-Wentworth Region for the Disabled and Aged Regional Transportation Systems (DARTS). Comshare transferred their rights to the system to Productivity Systems Inc. who installed and customized the system for Edmonton.

The system configuration is a multi-user system of six remote terminals plus one console terminal for a total of seven work stations. All terminals are linked to one Compaq Deskpro 286 with a 70 MB hard disk (Node 1) located in the dispatch/scheduling area. This micro processor (Node 1) contains all system files. A second Compaq 286 with a 30 MB hard disk drive (Node 2) is located in the administrative offices and is linked to Node 1 via coaxial cable. The Node 2 processor is used to maintain client registration files. Client files are updated and downloaded to Node 1 on a daily basis.

Six remote terminals are allocated to workstations as follows:

1 - Dispatcher
1 - Head Receptionist
3 - Reservation Clerks
1 - Scheduling

Tables 4.6 and 4.7 describe the hardware and software components of the system.

TABLE 4.6 HARDWARE SPECIFICATIONS

QUANTITY	ITEM
1	Compaq Deskpro 286 model 2 with 30 MB internal hard disk drive.
1	Compaq Deskpro 286 model 2 with 70 MB internal hard disk drive. Specifications of micro processors: - switchable 6 MHz - 8 Mz clock speed - 1.2 MB diskette drive - parallel printer interface - asynchronous communications interface - RGB monitor interface - real time clock - 80287 - 8 MHz with coprocessor - composite video interface - multi-terminal board
1	Hayes external modem.
1	Tall Grass tape system fixed disk drive backup.
6	Esprit 630 remote video terminals.
1	Toshiba P341e printer.

TABLE 4.7 SOFTWARE

SYSTEM	DESCRIPTION
Operating System	QNX version 2.05 by Quantrum Software Systems. - multi-user, multi-tracking, PC-DOS compatible.
Database Management System	ZIM version 2.53 by Zanthe Information. - fourth generation database management language with natural language English like syntax for simplified data retrieval.
Application Program	Comshare Limited licenced to Productivity Systems Inc. - Registration - 27 fields - four files divided by first letter of clients name. - Reservation - 21 fields - 7 files - one per day. - Scheduling & Dispatch - 25 field master file - daily file for daily schedule. - Monitoring - vehicle information - operating statistics - client statistics.

4.6 Applications Program Operating Procedures

The applications program is menu driven with a hierarchy of menus to permit operators to operate easily within the tasks being performed. The menu structure is shown on Figure 4.2.

The applications program is structured around four key functions, registration, reservation, scheduling, and monitoring which are performed daily. The total sequence of functions must be completed within a 24 hour cycle to permit the following day's operation to commence. Therefore, structured time frames have been developed which recognize user satisfaction, which provide time required by staff to make decisions, and which allow the computer run time to process the decisions and generate output such as driver run sheets, etc.

The importance of the computer is that it can assist in processing the information required for each of these functions to optimize the time trade offs between user requests for service, delivery of service and productivity and cost effectiveness.

Figure 4.3 shows the computer procedures which are followed on a daily basis for each function and the deadlines for each function where applicable.

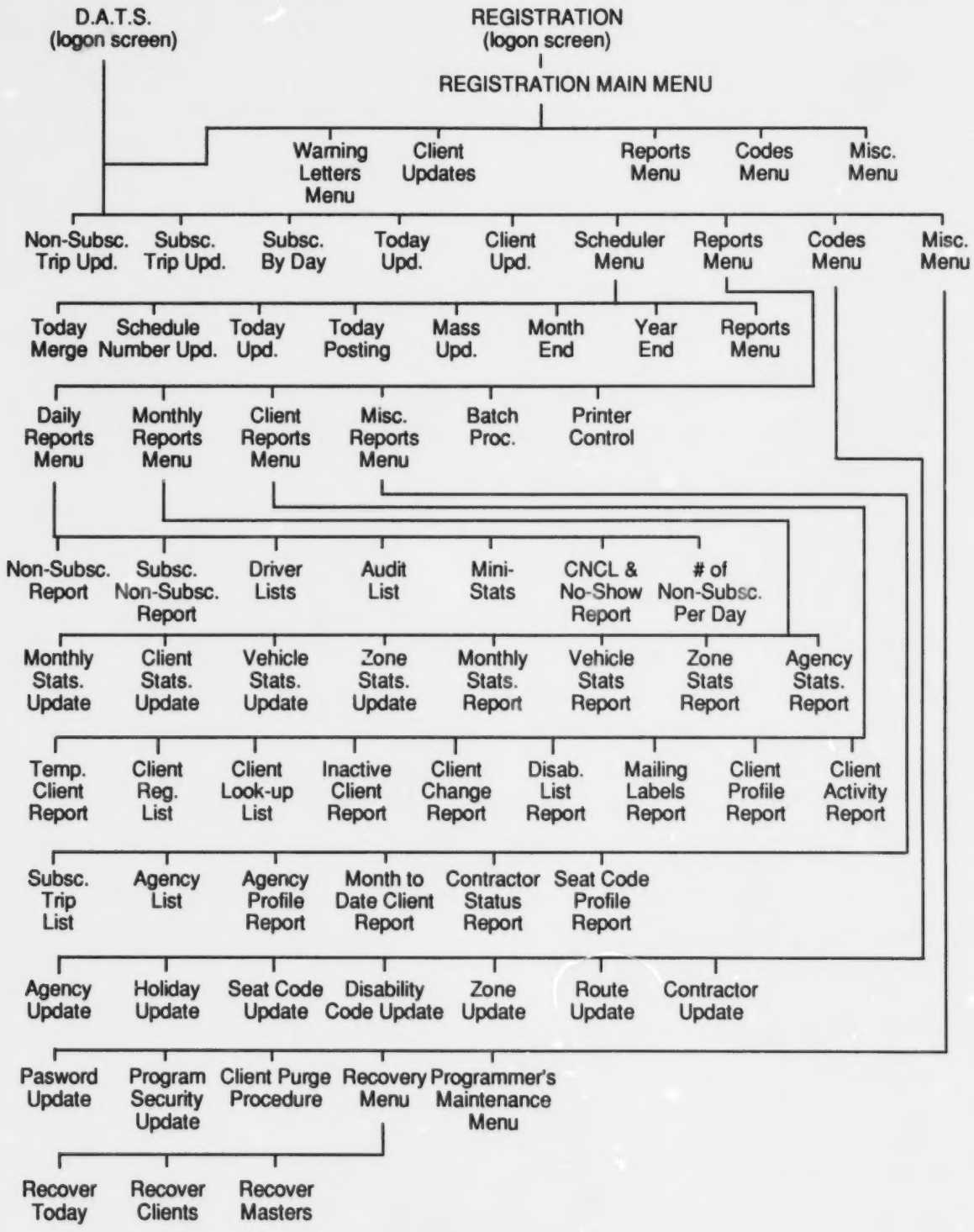


Figure 4.2: D.A.T.S. Computer Aided Scheduling System (Menu Structure)

DATS4.2

05:00 — **Dispatcher**

- arrives at work and performs a tape backup of the data files.
- distributes the daily run sheets to the respective contractors.
- updates late cancellations on the run sheets and computer.
- monitors the day's activities, recording changes as they occur.

06:00 — **Reservation Clerks**

- first shift arrives at work and proceeds to add trip requests into the computer for one (1) to two (2) days in advance.
- record changes for trips for one (1) to two (2) days in advance (i.e. cancellations, time changes, etc.).

08:00 — **Administration**

- produces a hard copy of previous day's trips.
- produces a hard copy of the previous day's trip statistics.
- updates on a daily basis the client registration files.

09:00 — **Head Scheduler**

- arrives at work and proceeds to update the master trip files.
- continually optimizes the master routes.
- records temporary cancellations and holidays for individual and multiple clients.

12:00 — **Dispatcher**

- performs a tape backup of the system data base files.

16:30 — **Scheduler**

- arrives at work and proceeds to produce a copy of the driver lists for scheduling purposes.

17:30 — **Scheduler**

- calls no longer accepted for trips in advance.
-scheduler produces a list of all unassigned trips that are to be scheduled for the following day.

18:00 — **Dispatcher**

- performs a tape backup of the database files
- continues to accept cancellations for future trips.
- continues to monitor and record trip changes for the current date.

19:00 — **Dispatcher**

- performs the "merge" procedure for three (3) days in advance.

22:00 — **Scheduler**

- enters route numbers for previously unassigned trips.
- produces the driver lists for the various contractors.
- checks for any errors that may have occurred during scheduling.
- produces a final copy of the driver lists if necessary.

24:00 — **Dispatcher**

- performs the "posting" procedure and completes his/her shift.

Figure 4.3: DATS Computer Aided Scheduling System Procedures

4.7 Customization and Installation

The official contract was awarded March 19, 1986 and the work to customize the system intitiated April 23, 1986. Subsequent to the contract award to Comshare Limited, the firm transferred the contract and rights to the program to Productivity Systems Inc. The confirmation of the transfer of the contract through the City of Edmonton approval system delayed the completion of modification and customization from June 1986 to September 1986. A further delay of installation was created by a delay in the construction renovations to the DATS dispatch and scheduling office. The renovations were designed to improve the work flow to complement the introduction of the new system. Final installation of the system commenced in October and the new system was put into operation October 27, 1986.

4.7.1 Customization

Although the objective for selection of a new system was to obtain an off- the-shelf product with a tested performance record, it was recognized that any system would require customization to meet the specific operational requirements of DATS. Table 4.8 outlines the major features customized for DATS.

TABLE 4.8 CUSTOMIZATION

NEW FEATURES	COMMENT
Upgrade Capacity	A critical requirement was to configure the system to accommodate the larger size of DATS in terms of staff workstations and computing capacity. Two changes were introduced; (1) an updated version of the operating system was incorporated to permit number of work stations to be increased from previous limit of 5; (2) a second CPU was introduced to permit registration functions to be performed independently and downloaded in off-peak periods. Therefore reducing the demand on the main CPU needed for reservations and scheduling.
Zones	To provide a basis for origin/destination analysis, to provide an additional scheduling aid, and to provide an opportunity to develop an add-on automatic scheduling function, a zone system and zone utility file were created.
Report Formats	Most of the report formats were customized to reflect DATS procedures and administrative reporting requirements, i.e., driver's run sheets, booking list, statistic reports.

4.7.2 Installation and Training

Four major tasks were undertaken: (1) hardware and software testing, (2) file transfer of data from existing system to new system, (3) staff training and, (4) transition from old system to new system.

Hardware and software testing was undertaken to satisfy the terms of the contract. Testing was completed in two cycles. Hardware was tested upon delivery from supplier and again after installation on site. The only major failure encountered was in the power supply module which was replaced. The software was run in dummy mode prior to installation to test response time and accuracy. After the system had been put

into operation for several weeks, acceptance tests were run and reported. As well, any abnormalities were recorded by staff and reported in the acceptance report issued December 5, 1986. Revisions in the program were made in February, 1987 in response to the December report and the system accepted by the City of Edmonton in March, 1987.

Considerable attention was paid to transfer files from the old system to the new. Because over 7,000 client files were involved as well as master schedules for each day, it was important to have an accurate transfer of information. Because the existing files were stored electronically, the transfer problem did not require a laborious process of entering of data but required insuring compatability between the systems.

Although DATS staff had been operating in a computer environment, and therefore did not have to be given any awareness training, training on specifics of the functions of the system was required. Training of the staff was undertaken by the contractor using the technical staff who had customized the system. This created some difficulties of comprehension because of the different knowledge base and language between the non- technical operating staff and a computer programmer. Fortunately, DATS had on staff an individual with both the technical knowledge of computers and programming and the on-line operating experience in scheduling, dispatching and driving. Having an individual with this combination of skills has proven to be invaluable in the installation and operation of the new computer program. First it provided on-hand assistance to deal with the day to day problems staff encountered as they learned the system. Secondly, it has permitted modifications to be made to the new system on an ongoing basis as new needs arise and as opportunities for enhancement are discovered.

Because of this in-house skill, the City of Edmonton purchased the source code for the applications program to facilitate enhancements. The enhancements now underway are described in Section 4.11.

The transition from the old system to the new was accomplished smoothly commencing October 27, 1986. Initially, running the two systems in parallel was considered but was rejected because of its complexity. Therefore the only overlap occurred for reservations during the two day period prior to implementation. The transition was facilitated by selecting a day with lowest demand i.e., Saturday. Also, the existing system was maintained as a back-up and additional dispatch staff were available, if necessary, to handle operations on a manual basis.

4.8 System Evaluation

4.8.1 Acceptance Testing

Acceptance testing was carried out for the hardware, systems software, and applications software and the systems accepted in March, 1987. Table 4.9 outlines the testing objectives.

TABLE 4.9 ACCEPTANCE TESTING

ITEM	OBJECTIVE
Hardware	.to confirm that all items specified were installed and operating.
Systems Software	.to confirm that the operating system and database management systems were installed and operating and ownership registered with developers in the name of the City of Edmonton.
Applications Software	(1) Database Design - to confirm that database was capable of capturing all needed data. (2) Data Validation - to conform that only valid data may be entered (3) Fit to booking cycle - to confirm that staff could find information needed to perform their tasks easily and quickly. (4) Valid computerized functions - to confirm that information entered matched output either as a screen display or a report. (5) Response time - to confirm that response times matched promised performance.

Although the performance of the system has met the expectations and criteria specified in the terms of reference and has contributed to improvements in the performance of the operation, some limitations have been experienced.

(1) Limitations of a Multi-user, Multi-tasking system.

Significant deterioration in response time during reservation booking is experienced when major processing functions such as report generation, etc. are being undertaken simultaneously. To reduce the impact, major processing activities are carried out in off peak times.

A second limitation also related to multi-tasking has been a "migration" of trips. When reservation and master schedule trips are merged to create a list of trips for scheduling and at the same time reservations are being booked through the system, trips previously assigned to a route move or migrate to another route. No explanation for this event has been found except that the problem does not occur when system is in single user configuration. Therefore, a procedure of requiring all users to exit system when these reports are generated has been put in place. Since some merging is done during the day when reservations are being booked, reservations are hard carded for later entry into system.

(2) Error messages were masked too quickly by screen reformatting causing operators to miss error messages. As well, error messages were stated in a way which non-technical staff found difficult to understand. Therefore, error handling has been modified. Descriptions of errors have been rewritten for non technical users. As well user cannot continue operation at terminal until error has been corrected.

4.8.2 Performance Evaluation

The impact of the new computer program on the DATS operations was assessed in the following three areas:

(1) Information Processing

Three areas of information processing critical to operations were reviewed to determine the impact of the system.

a) Registration file maintenance:

The DATS registration files have been on computer since 1983. The new computer program therefore did not have a significant impact on the efficiency of registration file maintenace except that it permitted the data fields to be evaluated and permitted two new fields to be added which improve review of the status of a client file. The first addition was to date stamp the date of the last change to a file. The second was to link the client file to the client trip file to display the information of the last trip taken by client.

b) Reservation Processing:

Reservation processing has been significantly enhanced in speed and accuracy by the elimination of hand recording except in downtime conditions. Accuracy has been increased by built-in error checking routines in the program and by reducing the amount of information to be inputted. Reservation clerks need enter only trip origin and destination and reservation times. Keyboarding of information has eliminated errors of handwriting interpretation. Speed has also been increased with a reduction in telephone time from an average 115 seconds to 45 seconds per call.

As well, a standardized pick-up time of one hour prior to requested drop off has been implemented to eliminate callbacks. ("Call backs" were telephone calls back to a user to confirm the pick-up time of a previously booked trip).

c) Trip status retrieval: (Dispatching)

Response to user inquiries about their trip status has been improved by on-line access to all current client trips. Under the prior system, only trips booked on the hourly bus contract were on-line. Therefore, retrieval of trip status information was done from card files of each day's reservations.

As previously discussed, information retrieval and data entry response times do deteriorate when the system is used simultaneously to generate and print reports.

(2) Management Information

The consolidation of all client trips on-line has increased the accuracy and turnaround time for statistical and system information reports. An audit list and mini stats report are produced daily for the previous day's activity. These reports are generated within an hour by the system. Under the previous program, which did not maintain a file on all trips, statistics were derived manually from paper records. It required from one half to one manday to assemble and record each day's statistics.

Daily information is now available for trips scheduled, trips cancelled, trips completed, no-shows. The system can generate user information to monitor activity. For example, the names of all users

who did not show up for their trip can be generated for follow up investigation. The system can also generate an "inactive user" report for any period required by management. Selective inquiries can be made of the status of inactive registrants during the specified period. Subsequent mailing lists can be producted to verify registration status.

(3) Productivity

The impact of the new computer on productivity in terms of trips per hour, is difficult to isolate from the impact of other factors such as better management methods, policy changes, changes in demand, improved contractor performance. The one area where a major change has been introduced by the new computer system is in the scheduling of the hourly based bus contract services. Scheduling decision making is now done by schedulers rather than through the use of the automatic scheduling trip addition algorithm of the previous scheduling system. A comparison of productivity for similar monthly periods under the two systems was done and is presented in Table 4.10.

TABLE 4.10 COMPARISON OF PRODUCTIVITY OF HOURLY BUS CONTRACT

MONTH	1986 (TRIP ADDITION ALGORITHM)		1987 (NEW PROGRAM)	
	PASSENGERS CARRIED	TRIPS PER HOUR	PASSENGERS CARRIED	TRIPS PER HOUR
JAN to MAR	33,668	1.85	32,122	1.82
APRIL	10,230	1.68	10,124	1.81
MAY	10,041	1.68	10,439	1.82
JUNE	9,953	1.69	10,673	1.76
AVERAGE TRIPS PER HOUR		1.73		1.80

(NOTE: This table reflects only one contract, the hourly bus service, and covers only the first six months of 1986 and 1987).

A comparison of productivity for both systems during the same 6 month periods indicates that over the period, productivity has improved marginally from 1.73 to 1.80 trips per hour for an improvement of 4%. However, it should also be noted that the trend has been positive in that most of the productivity improvement was recorded in the April to June period with trips per hour increasing from 1.68 to 1.80 or an improvement of 7%. It should also be noted that this productivity has been achieved with changes in practice which have reduced maximum passenger travel time from 1.5 hours to 1.0 hour. Contractual changes have also been introduced to contract to private van operators some of the wheelchair trips which would have previously been assigned to the hourly bus contract. The consequence of this change has been to concentrate hourly bus contract services during busier periods. However, in general it would appear that some improvements in scheduling productivity have been achieved as a result of the introduction of different scheduling methods with the new program.

4.9 Management Benefits

The introduction of a better information handling system has been an integral requirement of the "brokerage concept." The "brokerage concept" requires a more intensive information base to manage and track multiple contractors for accounting purposes and to optimize the assignment of trips to the various alternative service options.

With the introduction of the new system and the creation of an integrated trip file for all trips, significant improvements in the quality, accuracy, and response time for management information was achieved. Whereas previous trip statistic records were assembled manually from several sources, all client trip records are now entered electronically and can be used to generate a wide variety of reports limited only by the set of data elements and record storage capacity.

A daily audit list of all client trips taken the previous day is generated. The audit list is ordered by route number and specifies any changes from scheduled status; for example, cancellations and no-show, and generates aggregate totals for the day. A daily mini stats report is also generated on a daily basis which aggregates trips statistics by contractor. These records provide an audit trail to verify contractor invoices. With manual record keeping, frequent discrepancies occurred between contractor invoiced claims and dispatch records. The new information management capabilities of the system have reduced discrepancies between contractor invoices and dispatch records substantially. This is important where exceptions to the schedule often occur because of transfers from one contractor to another, because of exceptions where the contractor performed the service but through no fault of the contractor no trip was generated. Contractors are paid for trips where a user does not show. The better audit trail and record management permitted by the program has reduced accounting problems with contractors by better tracing of the exceptions and provided management with the means to improve control of expenditures. Faster turnaround time has also improved budget control by permitting variations from budget to be identified earlier.

The information system which provides for a centralized control of trip scheduling has also permitted management to identify client trips by user characteristics, trip type and trip time. The correlation of this information is an important tool in developing alternative allocations of trips to various contractors, in continuously tracking demand to adjust supply accordingly, and in advising funding authorities on the implications to the user community of changes in budget allocation.

4.10 System Limitations

While it is the objective of every system to provide optimal performance under all conditions, every system has limitations. What is important is to be able to identify where capacity thresholds for various systems occur to aid paratransit operators in selecting the optimal system for their sized operation. The difficulty is developing measures of capacity since system limitations are a function not only of the hardware and software, but also of policy decisions. Although measures of capacity in terms of explicit variables, the number of registrants, the number of trips, computer operating speed, computer memory, can be quantified, the capacity thresholds are influenced as much by management and operating policies, booking times, waiting time, travel time, which cannot be readily measured.

For the purposes of the evaluation of the limits of the new DATS computer system, performance and capacity thresholds were thought of in terms of time specifically user time, relative to service client or user opportunity costs. User time can be thought of in terms of trade offs between when a trip is booked and when it is taken, between when the user is ready for pick-up and when they arrive at their destination. The optimal utility for the user would be to book the trip at the moment one wants to be picked up and to reduce waiting and travel time to travel time only. This of course would require a vehicle to be on-call for

every registrant. Therefore, increasing constraints require the user to accept different levels of satisfaction with respect to time. Usually these constraints are introduced by policy decisions driven by operating budget limitations and the subsequent constraints of processing the information to schedule trips and to deliver service within the policy constraints.

Therefore in discussing the limitations of the new DATS Computer-Aided Scheduling System information handling limitations within the context of existing DATS operating policies and the present levels of user time satisfaction are being considered.

The experience of DATS with the new computer system would suggest that the present hardware/software configuration is operating at close to maximum capacity given existing policy constraints and "user time" expectations. The system presently carries between 1200-1400 trips per weekday during September to June with a registration of 8,000 clients.

The limiting factor within the system is the scheduling of trips on the lift equipped hourly contracted bus fleet. All schedules for this contract are prepared by scheduling and dispatch staff. The limitation is the number of trips which schedulers can physically handle and the computer can process in the 12 hour period between the present booking cut-off time of 1730 hours and the first run the following morning at 0600 hours. Within this period, route assignments must be done by a scheduler, driver run sheets completed and printed, trip lists for ambulatory users generated and printed, and the previous day's file maintenance completed to permit a new cycle to commence. The procedures are illustrated in Figure 4.2.

The hardware limitations include processing speed and memory capacity. Although processing speed does affect the response time of reservation clerks, and slows the inputting of reservation information when other functions are being processed, at present this does not limit the system since the telephone system and reservation staff levels have additional capacity to accommodate more demand. Processing speed however does affect scheduling by imposing deadlines for completion of schedule preparation to permit adequate time for the computer to process and print driver run sheets.

Memory capacity also imposes limitations, especially as registration grows beyond 8,000 users. The problem imposed by memory capacity is that some files which are required for report generation cannot be conveniently downloaded to the 30MB hard drive and still leave room for the application.

There are a number of courses of action in the short run and the long run to deal with capacity threshold levels and processing time limitations. In the short run, enhancement of the hardware with the next generation of micro processors; moving to a machine based on the 80386 micro chip, and adding larger capacity hard disks, i.e. from 70MB to 140MB will permit improvements in the processing speed which will subsequently provide additional scheduling time. There are also a series of enhancements to software which can be made, some of which are already being developed and are described in section 4.8. If demand for wheelchair equipped vehicles increases marginally, some changes will be required to deal with the scheduling limitations. Several alternative strategies are available including policy changes in booking cut off time, procedural changes in scheduling to subdivide the work into components, or introducing an automated scheduling tool which could be a module added to the existing program, such a module could be a completely new approach or an adaptation of the old DATS Computer Scheduling System.

4.11 System Enhancements: Future Development

As a consequence of operating with the program, and as a result of the City of Edmonton decision to purchase the source code for the applications program, the DATS staff have developed and will be introducing substantial modifications to improve ease of use of the program and to automate additional functions.

4.11.1 Ease of Use Enhancements

a) Function dating

To facilitate communication between staff members on different shifts and error tracking all daily maintenance activities such as system backups and file merging and posting are dated and coded with a staff identification.

b) Message set

As operations run 20 hours per day, seven days a week, communication between staff on different shifts is difficult. An automated messaging system will be introduced to provide staff with the day's notices displayed when they sign-in to the system.

c) Security levels

A more specific and detailed access security system is being developed to permit staff to have full access to files they require for doing their tasks and read only access to other files. For example, dispatchers need working access to the current day's trips but do not need access to future reservations.

d) Help and error messages

To facilitate staff training and to give staff a more responsive and understandable error handling routine, a help feature will be added. The help feature will prompt new staff through input routines. As well, error messages will provide more understandable explanations of error conditions encountered to assist in correction.

e) Screen formats

All screen formats have been redeveloped to provide a more consistent and logical path of inputting which conforms more closely to the sequence of decision making followed by an operator. For example, reservation clerks have found the first information provided by user is their destination and then their time of arrival.

4.11.2 Management Assistance Enhancements

a) System capacity report

This new feature will permit reservation clerks and management to be alerted on-line to potential overbooking of the system at specific time periods. Based on historical trip information, a matrix of system capacity per hour has been developed. This matrix can be updated automatically as the historical record changes or as additional buses are added to increase capacity.

When reservations are booked and allocated to a requested pick up time slot, the system will

automatically alert the reservations clerk by a trip refusal message prompt that the time slot is booked to capacity. The system will also prompt alternative times which are available. The reservations clerk can then negotiate alternative times with the client. If the trip is refused, a record is kept of the refusal for future analysis and capacity planning.

b) Statistic files

Both the contractor and client statistic files have been redeveloped to provide more comprehensive reports with increased fields.

4.11.3 Performance Improvements

a) Files have been restructured and indexes optimized to enhance the speed of searching routines. Some changes have also been made in printer control routines to speed up processing.

4.12 Summary

The introduction of the new computer system has successfully met the expectations of the DATS management. It has provided the stability and the management tool that was needed to complement the opportunities of the "brokerage management concept." It has achieved this success in a very cost-effective way.

The new computer system has also provided a base from which enhancements can be developed in logical and modular way to expand the capacity of the system to meet new demand levels or changes in service policies.

Although the intent in purchasing a new computer program was to select an off-the-shelf tested product, the experience of implementing a product developed for another system clearly demonstrated that substantial customization and enhancements are needed to tailor the system to reflect the operating and management policies of a specific system. The enhancements and customization of an existing product however may still be preferable to development of an original product which has its own set of problems of uncertainty.

5.0 EVALUATION

5.1 Introduction

The purpose of the Project was to meet the following objectives.

1. Evaluate the "brokerage management concept" as a means of achieving greater cost effectiveness through the coordinated assignment of trips to the most appropriate service option.

2. Achieve greater fiscal control of the system through a centralized control over trip assignment.

3. Facilitate the testing of an off-the-shelf computerized scheduling and management system appropriate to the trip assignment and control requirements of a brokerage system.

In addition the "brokerage management concept" was expected to improve service quality and administrative operations through the following objectives:

1. To improve consumer access by reducing congestion on the telephone system.

2. To reduce the possibilities of errors in client bookings.

3. To improve service reliability.

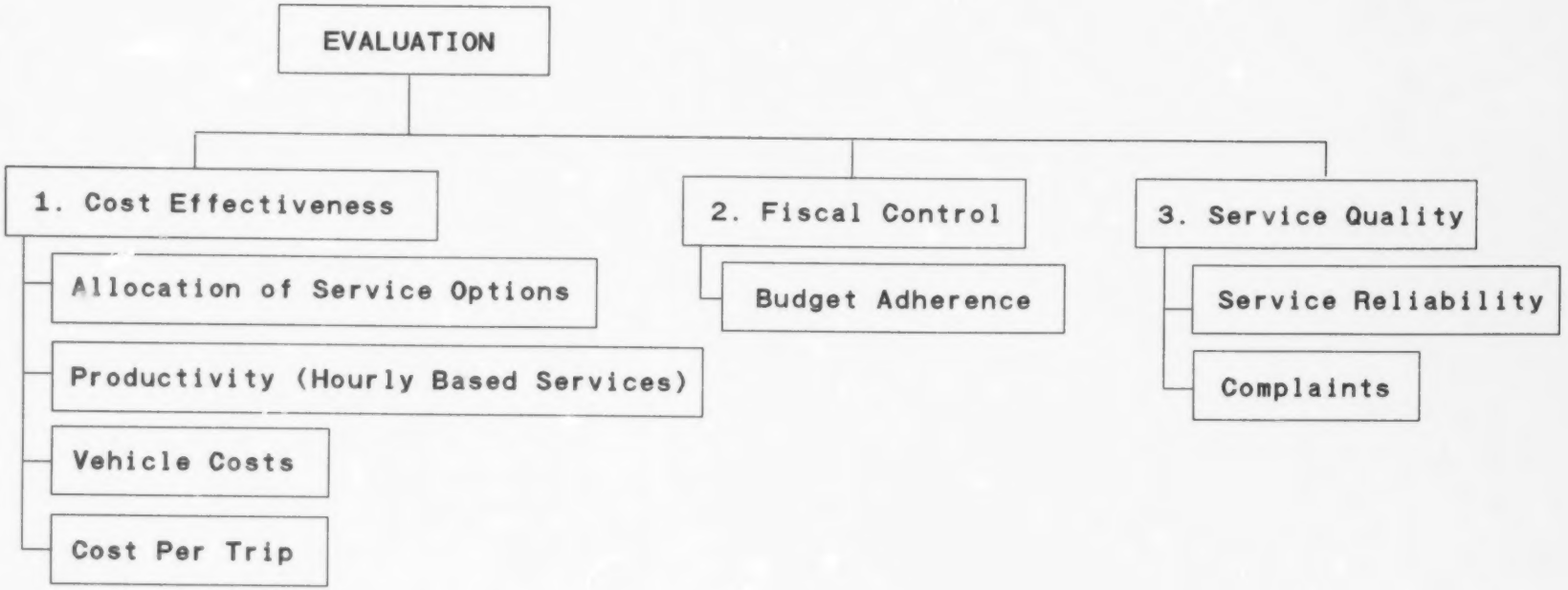
4. To improve bus scheduling.

5. To maintain vehicle utilization (productivity) levels.

6. To improve budget adherence.

The following chapter is an evaluation of how effectively the "brokerage management concept" met its objectives during the demonstration period compared to the experience of the prior operation. Figure 5.1 shows the elements of the system which were evaluated. Although the original intent was to compare the standards of service of the last year of pre-brokerage operations with the first year of the brokerage operation, the delay in the nstallation of the new computer provid ed an opportunity to compare the data from two years of brokerage operation. It also has permitted comparison of the brokerage operation under two different computer operations. In the pre-brokerage year and in the first year of brokerage the same computer program, the DATS Scheduling Computer System, was used. For most of the second year, the new micro computer based program was used.

Table 5.1 describes the periods of comparison and the conditions of operation during each period.



DAT9\5.1

Figure 5.1: Evaluation Elements

TABLE 5.1 PERIODS OF COMPARISON

NAME	DATES	SYSTEM	COMPUTER COMMENTS
Pre-Brokerage	Aug'84-July'85	DATS Trip Addition	Total system including scheduling and dispatch contracted to two contractors.
Brokerage Yr.1	Aug'85-July'86	DATS Trip Addition Algorithm	Centralized scheduling and dispatch directed by City. Service contracted to several contractors.
Brokerage Yr.2	Aug'86-July'87	New System DATS Computer Aided	Same functions as year 1

The data for the evaluation was assembled from several sources:

1. A user survey conducted in June 1986.
2. The Auditor General of the City of Edmonton's financial analysis of the pre-brokerage and first year of operations.
3. Operational statistical summaries generated by dispatch and scheduling staff.
4. Financial data generated by the Finance Branch of the City Transportation Department.
5. Interviews with contractors and City staff involved in various aspects of the brokerage operation.

Although every effort has been made to maintain consistency of the statistical records for the periods used, it should be noted that there may be variations in the statistical records between the pre-brokerage operation provided by contract and the first and second years of the Project. The brokerage period records were audited in detail. The pre-brokerage figures were not audited. The City's contract with the contractor did not provide a mandate for the right of audit because the contract was based on a fixed fee per unit of service and not cost plus. Normally an audit would not be required for a fee per unit of service contract.

5.2 Cost Effectiveness

The application of the "brokerage concept" to a paratransit system is based on the observation that better productivity and better cost effectiveness can be achieved by utilizing vehicles with different equipment and cost structure to match patron disability requirements. For example, since a high proportion of disabled persons are still ambulatory and do not need expensive wheelchair lift-equipped types of vehicles, less expensive vehicles can be utilized such as sedans and passengers vans. Also, more competitive prices can be obtained by using a broader range of contractors in service delivery. Hence, the paratransit operator can become a true "broker", between those who need service, disabled persons, and those who provide service(taxis, passengers and lift-equipped vehicles).

5.2.1 Allocation of Trips to Service Options

The objective of the brokerage function is to allocate service to the most cost effective service provider given the requirements of the users. Since approximately 50 percent of the users require wheelchair equipped vehicles which are the most expensive form of service, it should be possible to achieve greater service cost efficiency if the ambulatory trips can be allocated to providers with lower cost per trip rates. Figure 5.2 illustrates how the distribution of trips to the various service options has changed in the three periods. As is shown the brokerage has successfully been able to improve the match of wheelchair trips to wheelchair vehicles. In the pre brokerage period 83 percent of all trips were carried by the hourly wheelchair equipped buses. By the second year of the brokerage the hourly wheelchair equipped buses were carrying only 49 percent of the total trips which more closely matches actual wheelchair trips. Although not shown in Figure 5.2 flat rate vans also are lift-equipped and carry a portion of the wheelchair trips especially during off peak periods.

5.2.2 Productivity

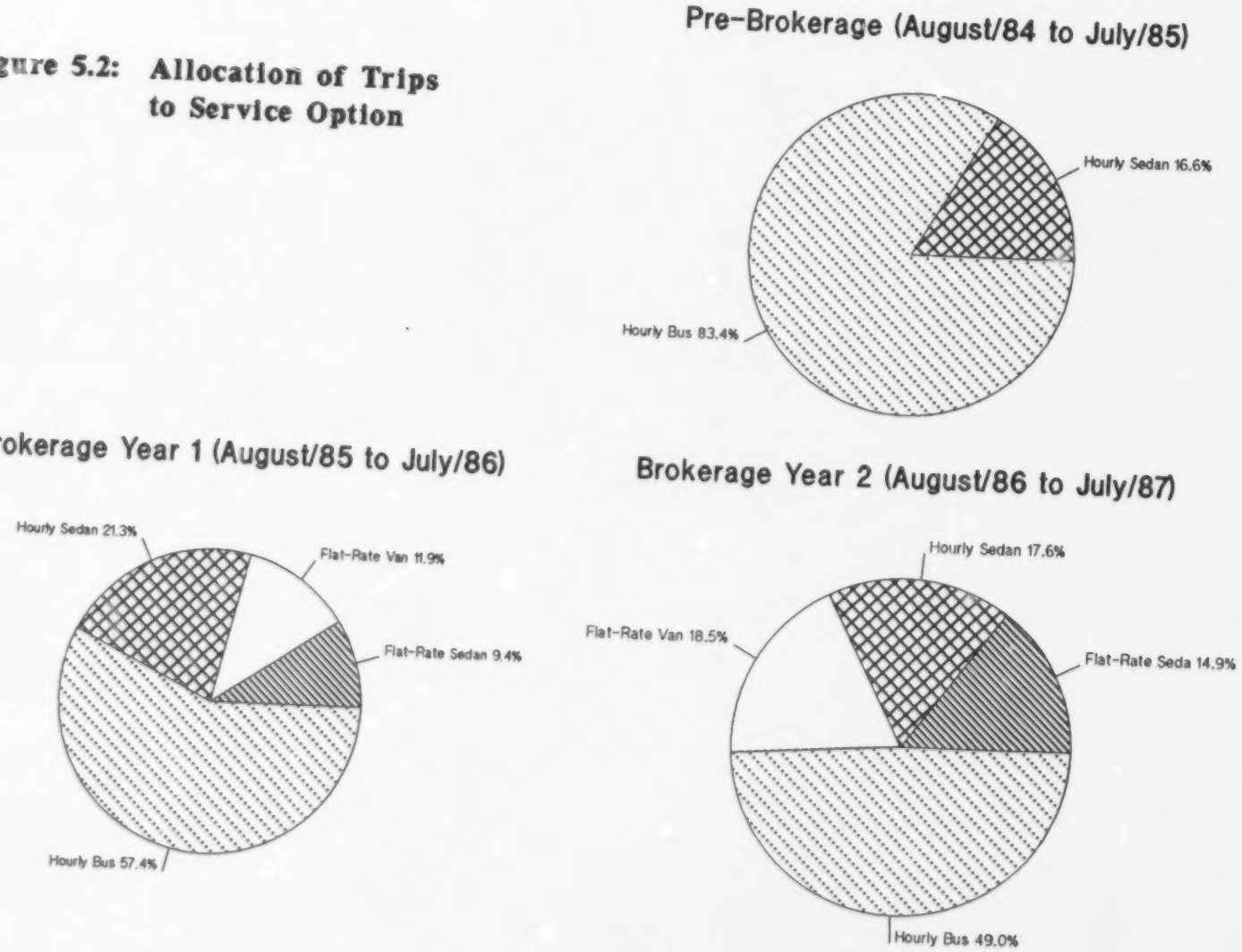
A second objective of the project was to maintain productivity (the actual trips carried per operating hour on the hourly based services). Hourly productivity on flat rate contracts is the contractor's responsibility and does not affect the cost effectiveness on the system. Therefore it has not been included. Table 5.2 illustrates productivity on each hourly service; the hourly based buses, the hourly based buses for ACT, and the hourly sedan peak hour service. Productivity appears to have dropped from pre brokerage levels, however they have remained consistent over the two years of brokerage operation. Investigation of the reason for this difference appears to indicate a variation in statistical methods rather than a difference in performance (for example, pre brokerage no-show trips were included as trips carried). The figures for the brokerage years are based on an audit and verification of actual trips between dispatch records and contractors' submission of fare receipts. Pre brokerage statistics were based on ridership data provided by the various contractors and not subject to City audit.

Therefore the statistical records may not have been maintained on a consistent basis either in terms of definition or in verification procedures between the pre and post brokerage periods.

TABLE 5.2 PRODUCTIVITY ON HOURLY BASED SERVICES
(TRIPS CARRIED PER HOUR)

	PRE-BROKERAGE AUG'84-JULY'85	BROKERAGE YR.1 AUG'85-JULY'86	BROKERAGE YR.2 AUG'86-JULY'87 (NEW COMPUTER)
ITEM	TRIPS PER HOUR	TRIPS PER HOUR	TRIPS PER HOUR
Hourly Bus	2.13	1.80	1.76
Hourly Bus (ACT)	3.45	2.68	4.27
Hourly Sedan	2.70	1.98	1.93
OVERALL	2.38	1.91	1.94

Figure 5.2: Allocation of Trips to Service Option



5.2.3 Vehicle Costs

A major variable influencing cost is the cost of operating the wheelchair lift-equipped vans which are mostly City owned vehicles. Substantial cost savings have been achieved in vehicle costs through more effective use of vehicles, through better fleet management, and through a reduction in the number of City-owned vehicles with increased use of contractor supplied vehicles.

Although it is not possible to compare the brokerage period with the pre brokerage period, it is possible to compare the two years of brokerage operation. Table 5.3 shows the total kilometres and kilometres per trip achieved during the brokerage period. Table 5.4 provides the vehicle operating costs.

As well the brokerage system and the opportunity to contract more work to contractor supplied vehicles has also permitted the City to reduce the number of vehicles in the City-owned fleet and as a consequence over the longer term to reduce its capital investment. Table 5.5 shows the number of vehicles in the City's fleet at the end of each period.

The reduction in the long term requirement for City-owned vehicles will have important budget implications by reducing DATS capital funding requirements. As well the reduced numbers of vehicles will also reduce total vehicle maintenance and operating costs.

TABLE 5.3 VEHICLE UTILIZATION CITY-OWNED VEHICLES

	PRE-BROKERAGE AUG'84-JULY'85	BROKERAGE YR.1 AUG'85-JULY'86	BROKERAGE YR.2 AUG'86-JULY'87 (NEW COMPUTER)
ITEM	TRIPS PER HOUR	TRIPS PER HOUR	TRIPS PER HOUR
Kilometres per trip	not known	9.67	9.57

(NOTE: These figures are not total system mileage since they apply to only the two hourly bus contracts using City-owned vehicles).

TABLE 5.4 VEHICLE COSTS (HOURLY BUS CONTRACTS)
CITY-OWNED VEHICLES

	PRE-BROKERAGE AUG'84-JULY'85	BROKERAGE YR.1 AUG'85-JULY'86	BROKERAGE YR.2 AUG'86-JULY'87 (NEW COMPUTER)
ITEM		$	$
Cost per hour	unknown	$ 7.74	$ 6.63
Cost per kilometre	"	$ 0.423	$ 0.356
Cost per trip	"	$ 4.09	$ 3.41

(NOTE: These costs are not system vehicle costs but apply only to City-owned vehicles utilized on hourly bus contracts. Costs include operating costs only; fuel, maintenance and repair).

TABLE 5.5 CITY-OWNED VEHICLE-FLEET SIZE

ITEM	PRE-BROKERAGE AUG'84-JULY'85	BROKERAGE YR.1 AUG'85-JULY'86	BROKERAGE YR.2 AUG'86-JULY'87 (NEW COMPUTER)
Number of vehicles as of July 31	38	43	36

(NOTE: These figures are for City-owned vehicles only and do not include contractor provided vehicles).

5.2.4 Cost Per Trip

The most important objective of the brokerage was to reduce costs per trip to permit increasing demand to be accommodated without total budget increases. Significant results have been achieved in reducing costs per trip for the system as a whole. Table 5.6 illustrates the costs per trip in current dollars for each service option plus administrative costs per trip in all three periods. It should be noted that cost are in current dollars not constant dollars therefore these costs do not control for inflation which has in fact occurred since cost of living adjustments were included in the hourly contracts. For example, during the second year the hourly rates were increased by approximately 5% over the first year of brokerage operation.

As Table 5.6 illustrates, overall costs per trip have been reduced by 12.4% from pre brokerage to the end of the second year of brokerage operation. Although some cost reduction between the pre and post brokerage periods may be partly due to changes in economic conditions, cost per trip has also declined between the first and second years of the brokerage when economic conditions and contract conditions remained constant with the exception of cost of living adjustments.

Most of the cost savings can be attributed to the "brokerage function", that is the allocation of trips to the most cost effective service option given user requirements. This is most apparent when the figures for cost per trip are correlated with the percentage of total trips allocated to each service. For example, in the pre brokerage period 65% of the total system trips were carried by the hourly bus service which had the highest cost per trip. By the second year of brokerage only 41% of the trips were carried by the hourly bus service which has remained the highest cost service option. On the other hand flat rate van services which have the lowest cost per trip have increased their share of trips from zero in the pre brokerage to 18.5% by the second year of brokerage operation.

TABLE 5.6 COST PER TRIP (CURRENT DOLLARS)

	PRE-BROKERAGE AUG'84-JULY'85	BROKERAGE YR.1 AUG'85-JULY'86	BROKERAGE YR.2 AUG'86-JULY'87 (NEW COMPUTER)
ITEM	TRIPS PER HOUR	TRIPS PER HOUR	TRIPS PER HOUR
Hourly Bus	12.86	11.34	11.21
Hourly Bus (ACT)	7.85	8.80	6.65
Hourly Sedan	9.30	5.50	.89
Flat Rate Sedan	-	6.46	6.98
Flat Rate Van	-	4.03	3.62
Administration	0.57	2.27	2.62
OVERALL	$11.93	$10.81	$10.45

5.3 Fiscal Control

The brokerage has demonstrated substantial benefits in terms of fiscal control for the City Administration. Fiscal control is reflected in budget adherence, capital funding, and total budget allocation.

Table 5.7 illustrates budgetted net costs and actual net costs of operating the DATS service from 1984 to the present. Since the City's fiscal period is based on a calendar year, these periods are different from the other tables in this chapter and reflect calendar year costs and in the case of 1987, costs to the end of July 31, 1987.

One of the important differences introduced by the brokerage commencing August 1985 was the City collecting fare revenue. Prior to the brokerage fare revenues were retained by the contractors.

TABLE 5.7 BUDGET CONTROL

(Figures are in current dollars)

	1984	1985 1/2Contract 1/2Brokerage	1986 Brokerage	1987 (To July 31/87) Brokerage
Budget (Net Cost)	2,914,733	3,179,526	2,864,098	1,509,714
Actual (Net Cost)	3,095,974	3,202,696	2,869,791	1,482,727
Variance	(184,241)	(23,170)	(5,693)	26,987
Percentage	- 6.2%	- 0.7%	- 0.2%	1.8%

Significant improvements in budget control have been acheived during the brokerage period with current expenditures in 1987 running a small surplus. Budget adherence has improved because of the direct management control available through the brokerage.

As well actual net costs for DATS in current dollars have declined by 7.3% between the last year of the previous structure and the first full year of brokerage operations 1986. In constant 1984 dollars total net costs of the DATS operation have been reduced significantly as shown by Table 5.8.

TABLE 5.8 TOTAL NET COSTS (CONSTANT 1984 DOLLARS)

	1984	1985	1986
Consumer Price Index	121.1	124.8	129.2
Increase over previous year		3.0%	3.5%
Actual Net Cost			
(Constant 1984 dollar)	3,095,974	3,106,615	2,683,354
Annual percentage change		0.3%	-13.6%

5.4 Service Quality

A third objective of the brokerage concept was to improve service quality for clients. This included reducing time required to book trips, minimizing errors in recording information, improving service reliability and improving scheduling. Several changes were introduced to improve service quality.

1. Service reliability and booking improvements - a policy of no refusals was introduced. Clients now felt more secure in making appointments and other committments knowing that they will be accommodated on the system.

   Certainity and better service reliability has also encouraged institutions to make more use of DATS for their clients. Insitutions require a high level of reliability and after a year testing the new DATS service have found it to be responsive to their priorities.

2. Comfort

   New vehicles have been introduced and improved rider comfort. The greater use of taxis has also improved service quality because they offer a more comfortable ride than buses or vans and because of the vehicle are perceived by users to be better transportation than buses or vans.

To measure service quality two methods were used. System statistics were reviewed to determine changes in ridership, cancellations, no show rates, and complaints and a user survey was undertaken. Table 5.9 illustrates the system trips statistics. Annual ridership, actual trips carried have increased 18 percent or from 258,933 to 305,690 trips which is significant.

Although it was anticipated that no show rates and cancellations would be reduced with the introduction of a now refusal policy and better enforcment of user policies with respect to no shows, cancellation rates and no show rates have not shown any consistent improvement. No show rates have dropped and then slightly increased. Cancellation rates have dropped in the first year of operation. In the second year changes were introduced in the method of tracking cancellation statistics when the new computer was introduced. With the old computer, trips that were cancelled prior to being scheduled were not recorded as a cancellation. With the new computer every trip reservation is now entered into the computer and must be cancelled to be removed and therefore is recorded as a cancellation.

TABLE 5.9 SYSTEM TRIP STATISTICS

ITEM	PRE-BROKERAGE AUG'84-JULY'85	BROKERAGE YR.1 AUG'85-JULY'86	BROKERAGE YR.2 AUG'86-JULY'87 (NEW COMPUTER)
Trips Scheduled	284,660	311,821	355,170
Annual Increase		9.5%	13.9%
Trips Carried	258,933	281,362	305,690
Annual Increase		8.7%	8.6%
Trips Refused	4,418	347	0
Total Cancels	25,677	26,205	37,572*
% of Trips Scheduled	9%	8.4%	10.6%
Total No-Shows	4,470	4,297	5,418
% of Trips Scheduled	1.67%	1.4%	1.5%

*In year 2 a change was made in how cancellations were recorded as a result of new computer program.

Table 5.10 illustrates user relation statistics. The increase in complaints from the pre brokerage period results from better tracking of user communication. All user comments are now directed to the administrative and the scheduling and dispatch centre, therefore, a comprehensive record can be maintained. Prior to the brokerage the record of complaints reflected mostly complaints directed to the City and did not necessarily include comments directed to the contractors regarding individual trip problems.

TABLE 5.10 USER RELATIONS

ITEM	PRE-BROKERAGE AUG'84-JULY'85	BROKERAGE YR.1 AUG'85-JULY'86	BROKERAGE YR.2 AUG'86-JULY'87 (NEW COMPUTER)
Complaints	262	793	894
Complaints/1,000 trips	1.01	2.82	2.92

A user survey was also done in June, 1986 to determine user observations about changes in service quality. The survey asked users to evaluate their current trip of the day with respect to driver performance, booking experience, and other observations about time and comfort. Provision was also made for users to compare their present observations with experience on DATS prior to the brokerage. The survey which was distributed by the drivers but returned by mail was completed by approximately one third of the users on the system that day. That was considered a very acceptable response rate. A synthesis of the survey indicated the user satisfaction with the service was very good. Very few negative comments or ratings were given. Approximately one third of the respondents included comments on the system; the majority of which were positive. The most negative comment related to problems of telephone access, either waiting on hold too long or not getting through. This is a problem which had been identified by the administration and new procedures were being developed to streamline phone answering services. The results of the user survey have been appended to the report (Appendix III).

5.5 Summary and Conclusions

The brokerage demonstration has successfully shown that the "brokerage management concept" can achieve greater cost effectiveness and fiscal control. It has not only demonstrated its effectives in financial measures but also has achieved its objectives increasing service quality and user levels of satisfaction.

The "brokerage management concept" cannot be measured solely or the basis of traditional measures such as productivity per hour especially with the wide range of different service options available and the fact that flat rate service options now account for approximately one third (30%) of the trips carried. Allocations of trips among the different service options may create a negative impact on a specific service option in terms of cost per trip and productivity, but if it also generates a cost saving for the system as a whole a benefit has been achieved.

The brokerage concept has achieved non operating cost benefits which are not reflected in traditional cost analysis and evaluation. Through the brokering of trips to contractor supplied vehicles, capital funding requirements have also been reduced by reducing the number of City-owned vehicles required. Since vehicle replacement occurs at different intervals many of the costs of reducing the City-owned vehicle size will become apparent in the longer term.

In summary over the two year period of operation, the brokerage management structure has achieved:

- reductions in cost per trip for the system as a whole by 12.4%.
- maintained annual actual net costs to a constant total dollar level.
- achieved goals of accommodating a high level of service demand with an increase in ridership of 18%.
- more effectively matched patron requirements with service options with marginal losses in productivity on hourly services but with total reduced costs for the system.
- improved fleet management and vehicle investment requirements.

6.0 OBSERVATIONS AND COMMENTS

6.1 Introduction

The application of the "brokerage management concept" has successfully met the objectives set out. The brokerage project has achieved significant improvements in cost effectiveness, costs per trip and improved fiscal and management control.

Prior to the implementation of the "brokerage", studies of the Edmonton disabled community indicated that the potential latent demand for service, especially if the qualifications were expanded to include the mentally handicapped, could generate substantial budget increases under the then current structure. Therefore it was essential that alternatives such as the brokerage concept be assessed. The experience of the past two years with the "brokerage concept" has confirmed that it provides an effective structure for management of paratransit services and more importantly provides a good management framework for future changes. Over the past two years of brokerage operations total annual trips carried have increased 18 percent. During the same period net operating costs in current dollars have declined by $225,000 or 7.3 percent.

The brokerage demonstration project has also generated some valuable experiences and insights which are not readily quantifiable but which have benefitted DATS, the City, and the disabled community.

In this chapter some of those observations are expressed as well some suggestions about the future role brokerage will have in the DATS operations.

6.2 User Policies and Management Flexibility

Paratransit is a dynamic service. By its nature it is closer to its clients and thus is more subject to the day-to-day events and seasonal factors which affect its users. The disabled community has unique sets of problems and users need to be dealt with more on a one to one basis.

The brokerage concept is a flexible instrument which can effectively respond to the need to provide transportation services on a more individualized basis.

For example, prior to brokerage the only service option was the hourly bus service which had little capacity especially during peak periods. Although the hourly bus service is still operating at capacity especially during peak periods, other options are now available such as a private flat rate van or sedan which can be added to the system on an incremental basis to fit in trips requests which previously would have been refused.

Increased options for service delivery permit the opportunity to find different ways to meet individual user needs. With only one service option users who could not be accommodated within that option would be denied service. More flexible and less arbitrary rules to control use of the system can be established because a number of service options are available and service can be adjusted more incrementally and quickly to reflect current conditions. Savings achieved by monitoring supply during slow periods can be used to supplement services and provide special services when required.

The brokerage management system has permitted DATS to operate with a very flexible set of service policies with respect to trip reservations and service response time without increase in its budget.

The brokerage has also increased management flexibility by giving the administration access to more

than one contractor. Since all the brokerage contracts are non exclusive, service can be allocated by the administration at their discretion. Under the pre brokerage structure, service was tied to specific contractors on an exclusive basis. Changes required renegotiation of the terms and conditions of the contract which limited flexibility and responsiveness to new conditions.

6.3 Public and Private Sector Relationship

The brokerage system has created a role for the private sector in the provision of paratransit service, but at the same time it has maintained control and accountability for the expenditure of public funds with public administration. The brokerage system with its competitive tendering, with its use of several contract options and many different contractors has permitted the benefits of competitive pricing to accrue to maximize the effectiveness of public expenditures. The range of contracts now include hourly based sedan, hourly based wheelchair lift-equipped buses and vans, flat rate taxi, flat rate sedan, and flat rate wheelchair lift-equipped vans. It has also provided an opportunity for the private sector to benefit from a business opportunity.

In addition, the economic base provided by DATS contracts has permitted the private sector to invest in wheelchair equipped vehicles. Since most of the private contractors are also operating in a taxi environment (most operators are affiliated with a taxi firm), they can also use their vehicles to provide private service to wheelchair bound individuals in the community on a fee basis. Without the dollars from DATS contractors, private operators would not have been able to carry the cost for these expensively equipped vehicles based on private demand alone. For those in the community who wish a higher level of service there is now a group of private operators available to provide service.

The involvement of several contractors has also introduced checks and balances into the system which would not normally operate in an environment with a sole source contract or a service run entirely by the municipality. Since trips can be allocated among the various contracts and since the contractors are always seeking to maximize the number of trips they receive, trip assignments can be made not only on the basis of price but also on the basis of performance.

6.4 System Management

Brokerage is a management intensive system requiring a good reporting system and tracking system to manage trip assignment, trip tracing and trip accounting information. The management information is then itself a tool to permit management to employ the flexibility of the brokerage contracts to adjust service incrementally to match previously established guidelines and budget constraints. Adjustments can be made on an incremental basis by route, by contractor, by day, to reflect actual circumstances and to reflect a long or short term requirements.

System management requires extensive contract management responsibilities. Good risk management practices must be in place to protect municipal liability and insure good contractor performance. Good system accounting procedures are needed to minimize discrepancies and to provide an audit trail to verify that invoice payments are correct. Effective monitoring of contractor performance is also necessary to deal with problems and to ensure adherence to contract specifications.

6.5 Operational Insights : Taxi Operations

During the course of the demonstration project a series of problems were encountered in establishing a reliabile contract for flat rate sedan services. Five taxi firms were tried before a successful contract was

put into place. The experience with the contracting of the flat rate sedan service generated several important observations.

1. Size of the firm:

   The flat rate sedan contract was designed to absorb the peaks and valleys by shifting demand of ambulatory patrons. Since significant fluctuations occur on both a daily and seasonal basis, the contract is not stable enough to be the sole source of income for a firm. Therefore a firm should be large enough to accommodate the peak periods without impairing its normal business. Alternatives utilizing a number of small firms operating in various parts of the city were tried but proved to be difficult to schedule. A smaller limousine service was also contracted but failed when conflicts developed between its regular service and the DATS requirements.

2. Employees vs. owner-operators:

   The organizational structure of the firms also proved to be important in performance. The taxi industry is itself based on a brokerage structure with a taxi firm providing dispatch services for individual owner-operators. The successful performance of a taxi contract therefore can only be assured with the consent and agreement to participation by the owner-operators. One firm which was successful in winning a tender for service was not able to convince its drivers to participate at the quoted price and therefore was unable to perform. A second firm with hourly paid drivers also proved to be unsuccessful when the hours of service fluctuated dramatically with the demand. It should be noted that in this later situation the City brokened the trips on a flat rate/trip basis while the company paid its drivers by the hour.

A successful contract was eventually negotiated with a large taxi firm with the capability to meet fluctuating demand requirements. As well a price was negotiated which was close to the actual average meter rate per trip. With a fare structure closer to the meter rate, drivers were prepared to cooperate and be responsive to the service requests from DATS.

An initial assumption of the brokerage system prior to implementation was that costs per trip on the flat rate sedan service would be significantly less than metered rate because the business would be a supplement to the main activities of the taxi firms. It was assumed that efficient dispatching would permit adequate productivity for the drivers. What became apparent is that the owner-operators were not prepared to accept these trips unless the price was consistant with other opportunities, that is close to the meter rate.

6.6 Private Van Contracts

The most successful innovation of the brokerage has been the introduction of flat rate van contracts for ambulatory users for group trips and many-to-one services for schools, institutions, etc. Very effective cost per trip rates have been negotiated. As well the van drivers have invested in wheelchair lift-equipment and are assigned wheelchair trips in off-peak low demand periods when the cost per trip is less than committing an hourly based vehicle. A consequence of having flat rate wheelchair lift-equipped vans has been a reduction in the vehicle requirements for City-owned lift equipped vehicles which has generated both operating cost savings and capital cost savings.

6.7 Computer Applications

The introduction of a new computer system provided an important management tool to ease the administrative burden of the brokerage system. The computer system has permitted an efficient method of tracking information on an individual trip basis as well as an aggregated basis to provide feedback quickly on system performance.

The new computer also provided a base from which a strategic plan for computerized enhancements could be developed as needs require. Although the objective was to utilize an off-the-shelf system, it is apparent that each paratransit system has unique requirements because of user expectations, budget constraints, and the political environment. A full program of customization and enhancement of the original system has been undertaken for the DATS Computer Aided System because the enhancements provided real operating improvements, the resources and capabilities were available on staff to develop the enhancements and because specific operating constraints required changes to be made in the program.

The experience of DATS in introducing a new computer system would suggest that paratransit systems intending to introduce computer applications should recognize the impact of the products on their operating conditions and policies. Unless resources are applied to customizing an off-the-shelf product, operators should be prepared to accept the policy and operating assumptions of the system for which the application was developed if they are to take maximum advantage of the features of an application.

6.8 Future Developments

The brokerage system has provided DATS management with a firm structure for responding to a variety of changes in the operating environment.

To continue to minimize cost of service more fine tuning of the mix of service options to optimize the use of the various vehicle characteristics will be undertaken. The use of flat rate van contractors will be increased in off-peak and low demand periods when hourly services are not productive. Hourly services will be concentrated in periods of higher demand and where demand density is higher to achieve greater productivity.

In an era of increasing budget constraints, priorities for service may have to be established. These will have a impact on the level of service which can be provided to the disabled community by public paratransit agencies. The establishment of a viable private sector to provide services to disabled persons will reduce the dependency on subsidized public services to meet all transportation needs. Public funding could in term be diverted to other areas of need.

The mandate of DATS is to provide a parallel transportation service to public transit for the disabled community. When no other options are available the service levels provided by the publicly funded paratransit system such as door-to-door service create a level of service and expectations in the public which is closer to a service parallel to the taxi industry rather than the public transit system.

Now that a viable private wheelchair lift-equipped van service industry has been created in the City, DATS is in a better position to focus on its original mandate which is to provide a service parallel to the public transit system with a level of service consistent with that mandate. For those in the community who wish a higher level of service, a private van service now exists to meet that need in the same manner that the taxi industry is available for the public at large.

APPENDIX I

References

APPENDIX I

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APPENDIX II

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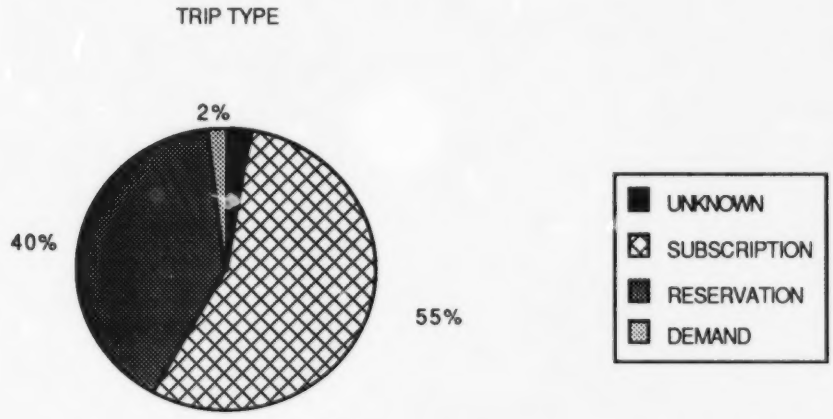
APPENDIX III

DATS PASSENGER SURVEY PRELIMINARY ANALYSIS

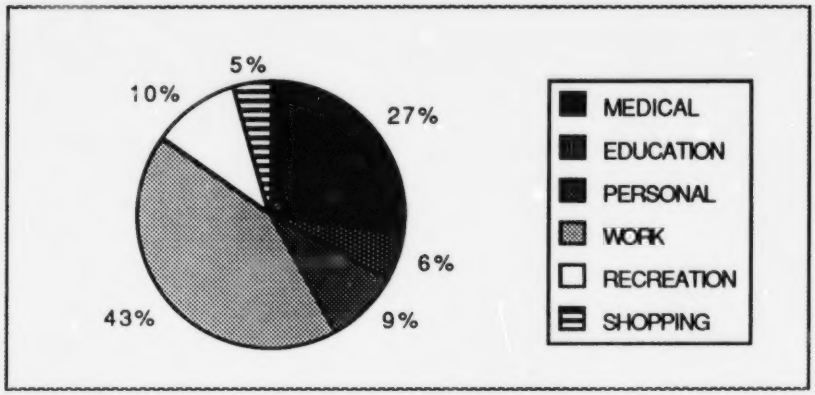
DATS PASSENGER SURVEY
PRELIMINARY ANALYSIS

A survey of all DATS passengers travelling on June 26,1986 was undertaken to assess the service since the initiation of the Brokerage system. The survey was a questionnaire provided to every passenger by the driver. The questionnaires were returned to the DATS OFFICE in an enclosed self addressed and stamped envelope. A total of 980 questionnaires were distributed and 336 returned. The response rate of 34% is considered to be excellent. The questions were designed to permit the passengers to give quantitative answers such as the travelling time and waiting time and to give qualitative answers such as the conduct of staff etc. As well ample opportunity was provided for passenger comment. A significant number of passengers provided comment on the service. Of the 336 responses, 142 provided some written comment on the service. The results of the questions are outlined below.

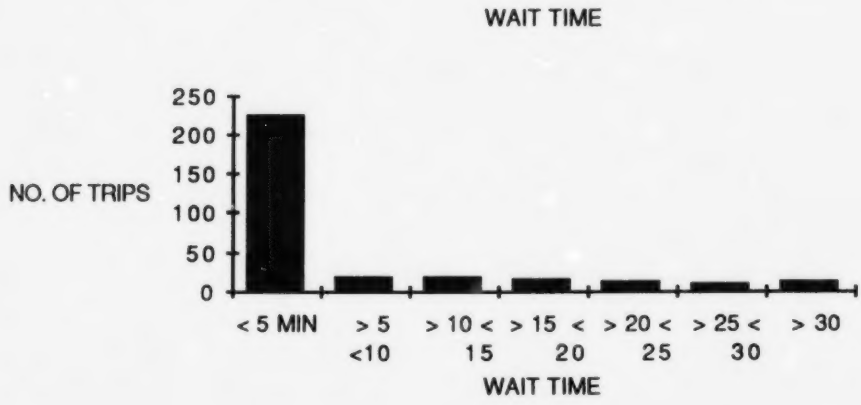
Question 1. What type of trip are you making?



Question 2. What was the purpose of your trip?

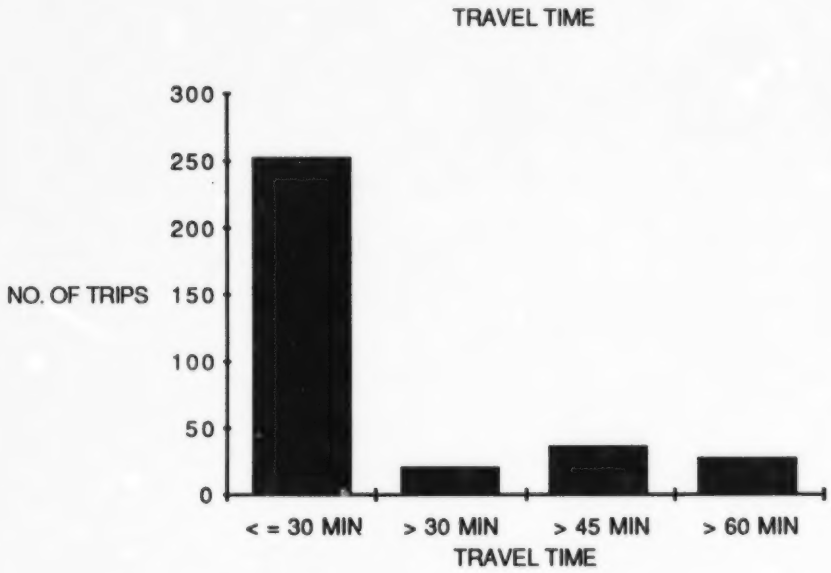


Question 3. What was your scheduled pick-up time and what was your actual pick-up time?
The results of this question provided an indication of passenger wait time. The system operates on the basis that a vehicle should arrive within 30 minutes of the scheduled time. arrival time within 30 minutes is thus considered standard.



Question 5. For how long did you ride on the DATS vehicle?

A standard for the service is that no passenger should travel longer than 90 minutes. Within that standard trip time will vary with distance travelled. The average travel time for all passengers in the survey was 28 minutes.



Question 6. Were you dropped off at your destination at the time expected?

1.Yes 293
2. No 31

Question 7. If your trip was a Reservation trip or a Demand trip, did you have any difficulty booking the trip?

1. Yes 31
2. No 191

Question 8. Was the person who booked your trip courteous and helpful?

1. Yes 232
2. No 6

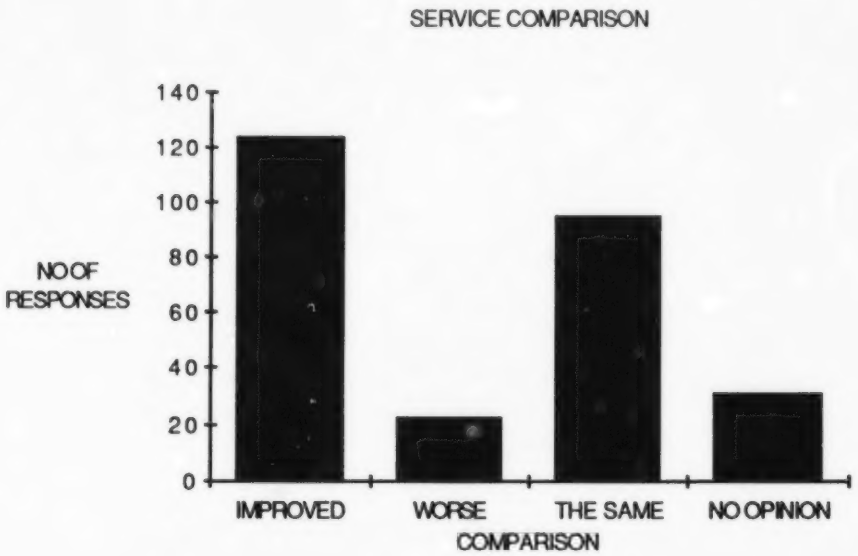
Question 9. How would you rate the condition of the vehicle (i.e. comfort, noise, cleanliness) in which you travelled today?

1. Satisfactory 324
2. Unsatisfactory 13

Question 10. Did the driver:

(a) Treat you courteously ?	1. Yes	314
	2. No	7
(b) Drive safely?	1. Yes	313
	2. No	3
(c) Provide assistance?	1. Yes	297
	2. No	15

Question 11. If you used the DATS service last June ,how would you rate the service compared to then?



APPENDIX IV

GLOSSARY

APPENDIX IV

Glossary:

A. C. T.	A recreational facility for disabled. A many to one transportation service is provided to the facility by DATS.
Audit List	A list of each passenger trip scheduled is generated daily. Information on status of trip is provided; that is completed, cancelled, no show.
Call back	When a pick-up time cannot be confirmed at the time when a reservation is made, passenger is called back to confirm pick-up time.
Demand trip	Reservations must usually be made by 1730 the day before a trip is to be taken. Demand trips are requests for trips made after the 1730 cut off time. Demand trips are only accepted based on spare availability.
Flat rate sedan service	A contract where companies provide drivers and sedans for ambulatory clients where payment for service is based on a flat rate per passenger trip.
Hourly bus service	A contract where a company provides drivers only for city owned wheel-chair equipped vehicles. Payment is based on scheduled hours of service.
Hourly sedan service	A contract where a company provides both drivers and demand for ambulatory clients. This service normally operates during peak hours. Payment is based on scheduled hours of service.
Mini stats report	A report generated on a daily basis which summarizes the pervious day's operating date on passengers carried, cancellations, no shows etc. Statistics are sorted by contractors.
No show	A passenger who has booked a trip and who has not cancelled that trip and does not appear when the vehicle arrives for pick up. Vehicles are allowed five (5) minutes to wait for a passengers before the trips is classified.
Reservation trip	A reservation is a trip booking made 2 days before, up to 1730 the day before the trip is to be taken.
Subscription trip	A subscription trip is a trip which is made on a regular basis on the same day of the week from the same location to the same destination. Generally such trips must be made at least 3 times per week.